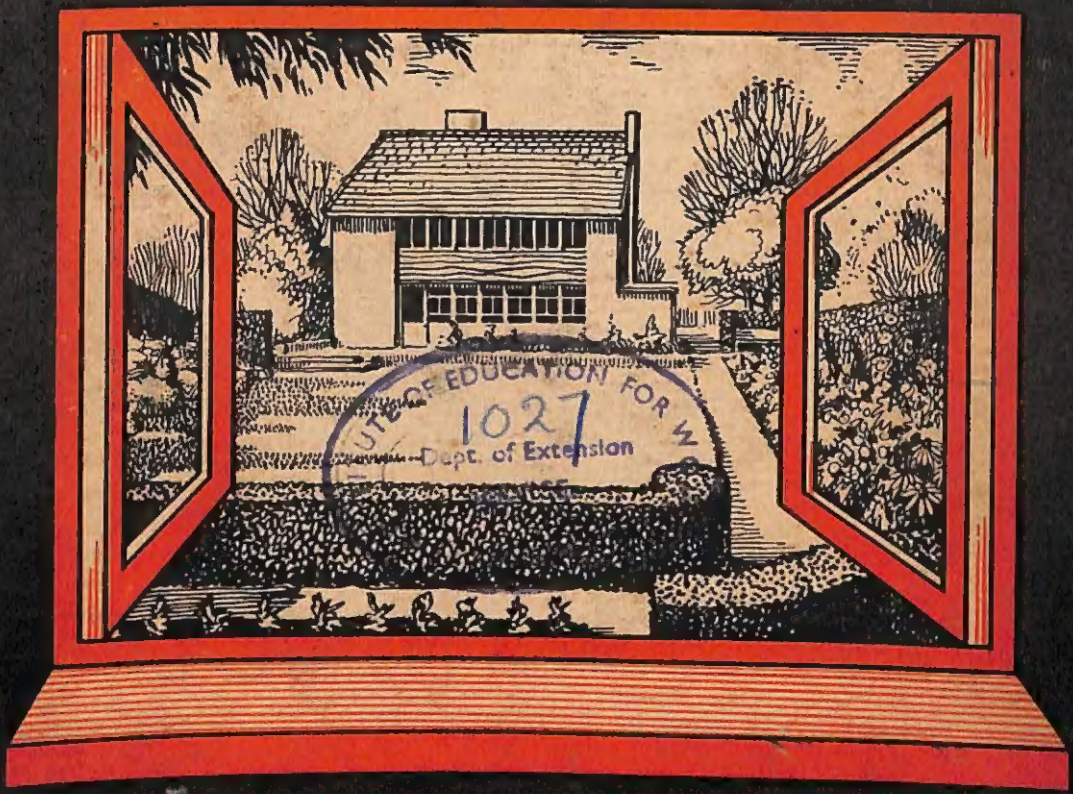
MEN AT WORK

HOUSES



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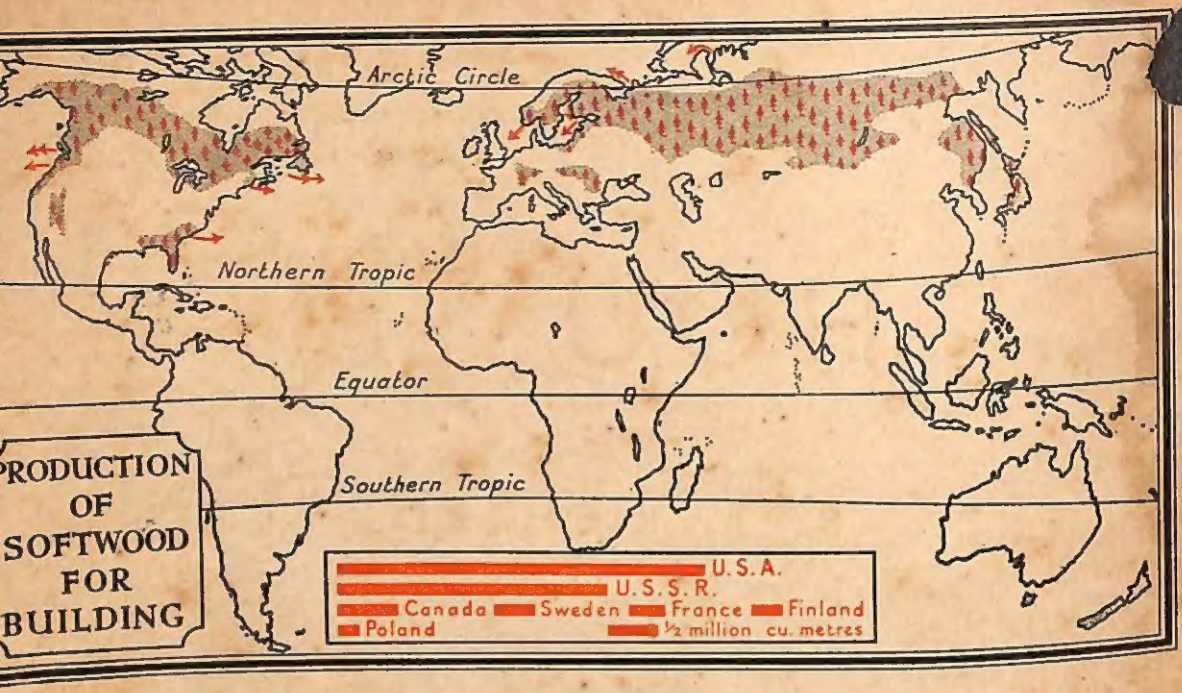
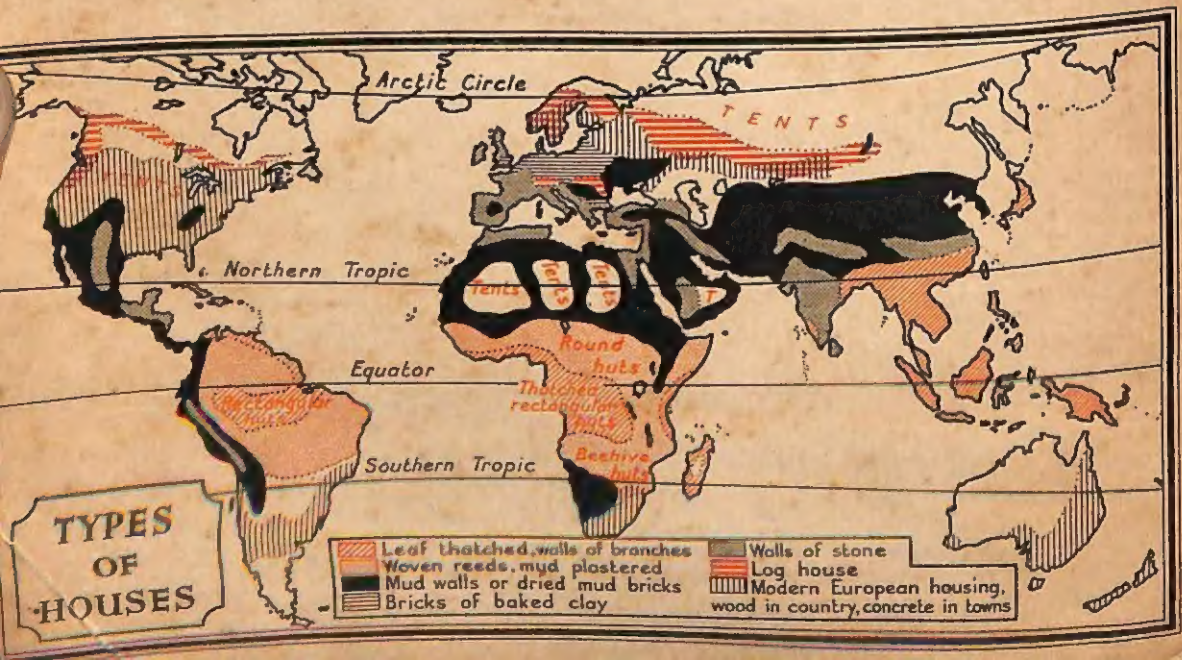
LONGMANS


Arctic Circle
Northern Tropic
Equator
Southern Tropic
PRODUCTION OF SOFTWOOD FOR BUILDING
U.S.A.
U.S.S.R.
Canada
Sweden
France
Finland
Poland
½ million cu. metres


Arctic Circle
TENTS
Northern Tropic
Tents
Round huts
Equator
Thatched rectangular huts
Beehive huts
Southern Tropic
TYPES OF HOUSES
Leaf thatched, walls of branches
Woven reeds, mud plastered
Mud walls or dried mud bricks
Bricks of baked clay
Walls of stone
Log house
Modern European housing, wood in country, concrete in towns

MEN AT WORK

GENERAL EDITOR : T Herdman, M.Sc

HOUSES

by

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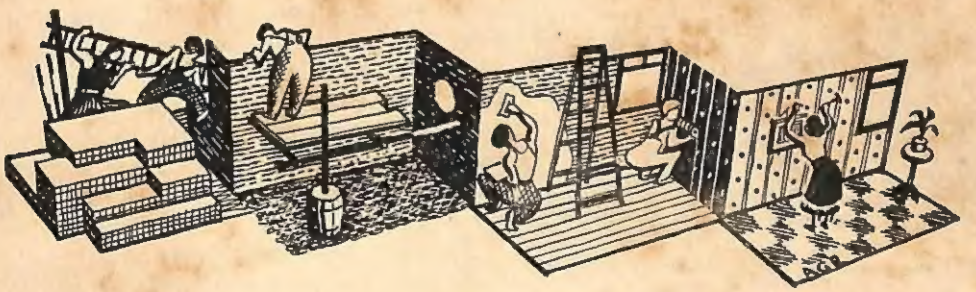


Fig. 1. The tree provides some shelter from rain and wind.

Fig. 2. The bell-tent is of the same pattern. Name corresponding parts of tree and tent.

Fig. 3. Early man sometimes lived in a cave. What purposes did the fire serve?

WHY HOUSES?

"I WISH I could stay out-of-doors always instead of having to come into a silly house," said Jim Whitehouse crossly. "I don't know why people want houses anyway." It had been a lovely summer day and he was not at all anxious to go to bed; he knew he would feel hot and uncomfortable indoors until he fell asleep. "Why don't you try?" said his father, laughing. "There is plenty of room in the back garden. Get Joe to help you, and I expect the pair of you will be able to find all you need to live out there." Jim went off to bed then, but it was not only the heat that kept him awake that night. His head was full of plans for the next day. He was up and round at Joe's home before his friend had finished breakfast, and they were soon deep in schemes for their adventure.

They decided they must have a tent, and much of the morning was spent in finding stuff from which to make it. Some old furniture wrappings from the attic looked likely material for a cover. What was there to hold it up? First they tried to copy the Army bell-tent, and then a wigwam made round bean sticks from the garden. But the sheets would not fit without cutting and the poles were difficult to fix upright. They soon found that their sheet, big though it was, did not cover much ground when arranged in those ways.

Their next idea was better. They fixed two poles upright with a third slung between. Guy ropes to pegs in the ground held the poles in place. The old sheet was stretched over the ridge pole, and both ends tied down to other pegs. This gave them more ground space, and Joe's idea of lifting one side and fastening it to two other poles gave yet more room. They had at least got cover from the sun and when some rain fell in the afternoon they dropped the side again and found that their roof kept them dry.

The boys were keen to spend the night in their tent, and persuaded their parents to let

Fig. 4. The first constructed house. The Australian aboriginal has got no further.

Fig. 5. A soldier's shelter made with a waterproof sheet.

Fig. 6. The kind of tent that Jim and Joe tried to make.

them try. They were a long time going to sleep. The ground was hard and their blankets surprisingly hot. When they did drop off at last, Jim was soon awakened by a yell from Joe. There was something moving in the tent! It had walked across Joe's chest and tickled his face, and they could hear it rustling the paper bag in which they had put some sandwiches. The flash-lamp soon showed that the intruder was—the Jones's cat from next door!

Before dawn they were awake again, this time shivering with cold. All the coverings they had thrown off earlier were now not enough to give them warmth. The grass was cold and wet with dew. Both were glad when they heard Jim's mother moving in the house and a hot drink was never more welcome than the one she provided then.

They spent much of the following day in improving their tent by cutting up some old material to cover in the ends. This, they explained to Jim's mother would keep out the cold night air, the chilly breeze and the cats, for they were determined to spend a second night in the garden.

They never found out whether it would or not, for a storm of wind and rain blew up after tea. The roof of the tent did not let much rain through, but the water that ran from it soaked the ground, and the wind blew the rain under the sheet till they were glad to run to the house for shelter. From the kitchen window they watched the end of their tent. Water began to trickle, and then streamed across the ground where they had meant to sleep. The wind shook the cover and loosened the poles and pegs until at last the whole thing collapsed in one sad heap.

"Well," said Jim's father when he came home and saw the ruins in the garden, "have you found out now why people build houses?" "Yes, I think I have," replied Jim rather sadly.

Fig. 7. An Arab tent has many poles, for it has to shelter a whole family. Would it be a good type in (*a*) a rainstorm ; (*b*) a windstorm ?

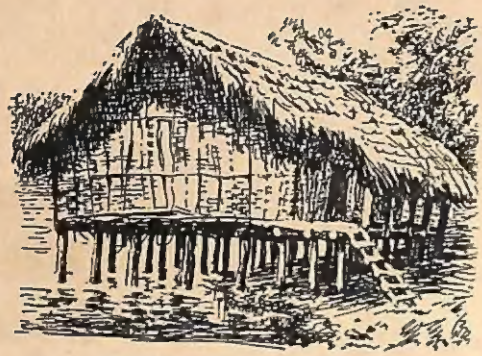


Fig. 8. An Indian house on stilts, with walls woven of thin cane and a roof of straw thatch.

Fig. 9. A house in the Sudan. The walls are of thin poles lashed together. The roof is made of reeds.

Fig. 10. A yurt on the Asiatic steppes. The trellis framework is of thin poles, and can be folded into a small bundle. It is covered with thick felt made of wool and hair.

OTHER PEOPLE'S HOUSES

WHEN Jim came down to breakfast the day after his tent had collapsed, he was disappointed to find it was still raining and looked like going on doing so. He had meant to try out some new ideas for his tent, but that was now impossible. His father had another suggestion to make. "Why don't you go to the library and see if you can find some books about tents and houses? You know what a wigwam is like, but other people besides Red Indians need houses and shelter. I'm sure the librarian will help you to find out about other sorts of tents and houses."

Jim fetched Joe and they set off together, though not very hopefully. But the librarian found so many interesting magazines and books for them that they needed no invitation to return and continue their hunt in the afternoon. What a talk they had that evening with Jim's father! They gathered round the kitchen table with pencils and paper and tried to sort out and explain what they had discovered.

They soon agreed that a good roof was the first requirement, for everyone dislikes sitting about or sleeping in the rain. To their surprise they had found that in some lands the people do not worry much about walls to their houses. The reason was clear enough—their weather is so hot that, in order to let in plenty of air, their houses have no walls at all or walls they can remove easily. When we open our doors and windows on summer afternoons we are really taking out parts of our house walls. Some people think that the word *window* should really be *wind-door*, i.e. a door to let in the wind.

Jim discovered an interesting thing about floors. Most peoples living in warm and rather dry lands are quite content to beat or tread the earth firm and use that for a floor. But those who make their homes in rainy or marshy lands, or where the land is sometimes flooded, raise their floors of poles or planks well above the ground and support them by the same posts that carry the roof. Houses built on hill-sides

have raised floors, too, so that they can have a level surface.

Joe was most interested in the materials used in building houses. The Eskimo makes his house of snow—roof, walls and floor. The Red Indian covers the poles of his wigwam with skins. The Arab's tent-covering is woven from goat-hair. The trappers and lumbermen of Canada use logs for their huts. Joe had known of these before, but his new list had many more items.

He had found that some roofs are covered with wide leaves from palm-trees or banana plants, whilst others are thatched with grass, straw or reeds. Strips of bark are used by forest dwellers, turf or stone slabs or slates in mountain lands, baked tiles where suitable clay can be obtained. In nearly every case these coverings to keep out the rain are laid on roof timbers.

For wall building Joe's list was even longer. Thin poles are often used, sometimes simply stuck in the ground, with twigs woven horizontally between them and then coated with mud or clay. Some people build up the walls with turf or mud that dries in the hot sun, others with bricks dried in the sun or baked in fires. On the mountain-sides, where winds are strong and cold, thick stone walls seem to be preferred.

It was Jim's father who pointed out to them one important fact the boys had not noticed—it takes a great deal of stuff of any kind to build even a small and simple house and so the builders use whatever material is close at hand. "Just as you did when you built your tent," he said.

Nowadays, good roads and motor vehicles, railways and ships, have made the transport of building materials much easier. They are such heavy and bulky things, however, that the cost of moving them soon becomes considerable. Sometimes the materials have to be carried a long way. In Britain we do not grow enough timber for building, so it must be brought from such lands as Russia and Canada, where there are great forests of softwood.

Fig. 11. The log cabin of a Canadian trapper.

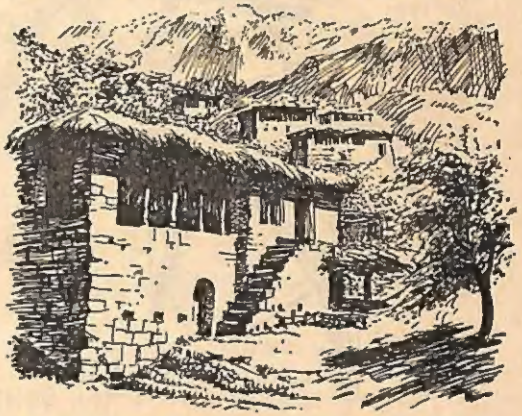


Fig. 12. A stone house in the western Himalayas.

Fig. 13. Mud-walled houses in a Palestine village.

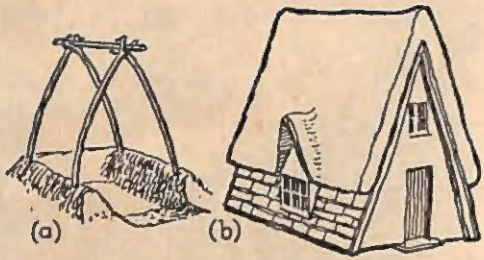


Fig. 14. (*a*) The framework of an early British house with sunken floor ; (*b*) A very old cottage in Lincolnshire, all roof and no wall.

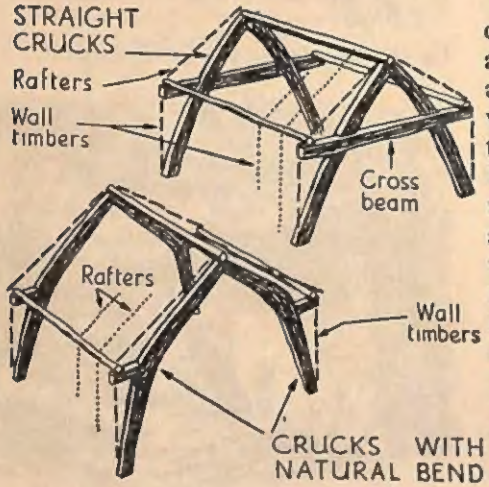


Fig. 15. How building with crucks and cross-beams led to the vertical side wall.

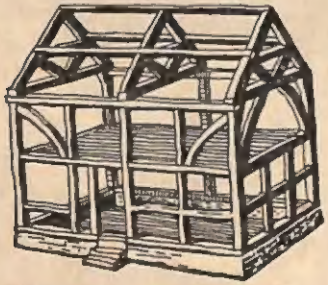


Fig. 16. When the framing of the walls was made strong enough to support the roof, crucks were no longer needed. Notice the curved timbers (brackets) that were used to strengthen the framework.

HERE and there in Britain you can still find remains of houses built hundreds of years ago. The methods of the early builders can also be learned from drawings in old books and written papers. Thus we can be quite sure that the first houses in Britain had only one room and were only one storey high. In this rather rainy land a roof was absolutely necessary and indeed the very earliest English houses appear to have been all roof and nothing more.

They were built in one of two ways. A pair of hurdles, such as were used to shut in cattle and to keep out wild beasts, leaning together and covered with leaves or leafy branches, would give some shelter. A house shaped in the same way could be made as you can see in Fig. 14 (*a*). Four poles stuck in the ground had the upper ends of each pair bound together so as to form a support for a ridge-pole against which branches, roughly woven twigs or bundles of reeds could be propped. Such houses provided only a sleeping place and some room for storage.

The second type was made by spreading branches and grass over a corner of the strong fence raised to protect the people and their animals against their enemies. This fence or *stockade* was made by driving stout poles into the ground or piling loose stones to form a rough wall.

To make room to sit or stand, the height of the ridge from the floor had to be increased. This was often done by digging away the earth so that the house became a roofed-in pit. Many improvements became possible when man invented the metal axe, and so was able to cut down trees. Poles and broken branches were replaced by heavier timbers. You can still find old farm buildings or cottages with roof-ridges supported by what are called *crooks* or *crucks*. The ridge-pole could now be made stronger and raised higher above the ground.

At first the roof still came down to ground-level at the sides. When the cross-beam was

introduced and carried out beyond the crucks it became possible to build upright side walls.

These longer ridge-poles soon became so heavy that they had to be supported in the middle by a post. Round this the family worked and ate and slept. Because of its importance this centre prop came to be called the *king-post*, a name still used by carpenters, though the post nowadays does not rest on the floor but on a strong beam from wall to wall.

When the saw came to be used in place of the axe, all these timbers could be cut straight and square.

Improvement in the methods of keeping out the rain went on in the same slow way. The builder used whatever he could find locally that would help to make the roof weather-proof. Where grass grew short and close, the turf was lifted in strips or slabs and laid on poles to keep out rain and snow and make the house warmer in winter. In marshy country and along river banks, reeds or rushes were gathered and tied in bundles to give good roofs. Where corn was grown, straw was used in the same way. Heather or gorse or shrubs often formed part of the covering. Later, thatched roofs became very common and are still to be found in many country districts. For hundreds of years the thatcher was one of the most important craftsmen in the English village.

A great step forward came when some forgotten inventor in a clayey district flattened out slabs of clay and burned them in a wood fire and so made the first roofing tiles. The old red, curved *pantiles* are still to be seen on farm buildings in some parts and are far more beautiful than the flat tiles used almost everywhere today.

In the stony hill country, where neither straw nor clay could be got, thin flat slabs of rock were used. The slates of Wales and Cumberland (which can be split into very thin, but quite weather-proof, sheets) were far the best (though perhaps the ugliest) of all roof-coverings and were used in most parts of Britain until replaced by the cheaper flat tiles.

Fig. 17. The simplest kind of flat roof—a pile of brushwood and straw resting on poles.

Fig. 18. Thatched roof of wheat straw on a cruck-framed cottage. The straw is carefully combed so that it lies from ridge to eaves.

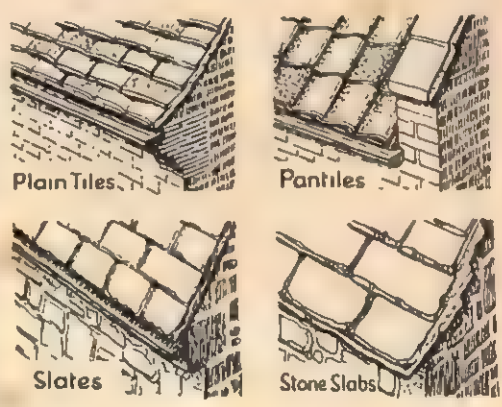


Fig. 19. How and why do the different kinds overlap? Which kinds are used in your district?

Fig. 31 The work done by different parts of a house.

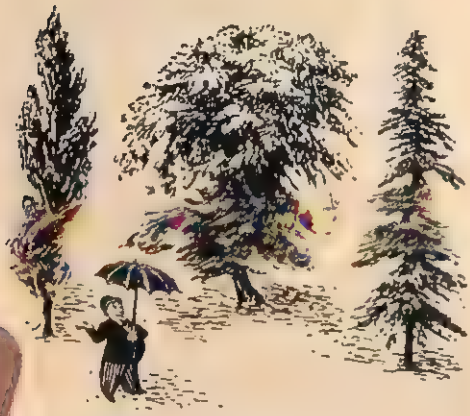


Fig. 32. Which tree gives most shelter?

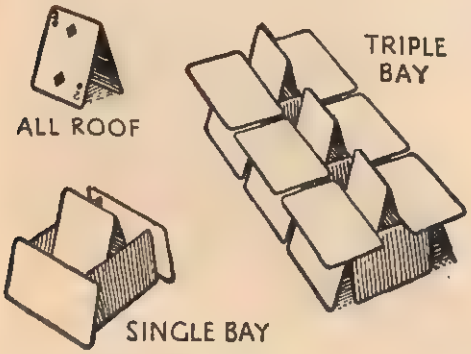


Fig. 33. Card houses.

1 Fig. 31 suggests the work done by the more important parts of a house. Complete what it shows, thus:

THE ROOF: *I keep out* (1) rain; (2) . . .; (3) . . . The number shown in brackets in the sketch tells you how many jobs each part of the house does. Try to find them all.

2 Men sheltered under trees before they made tents or houses. Which of the three kinds of tree shown in Fig. 32 would you choose for shelter?

3 An umbrella is a kind of portable house. In what ways is it like a tree? In what ways is a tent an improvement on an umbrella? What part of a house has played the part of the handle of the umbrella?

4 Arabs, Red Indians and Tartars are all tent-dwellers. Find out all you can about the kinds of tents they use—their shapes and materials, and the kind of weather from which they give protection. Would any of them keep out animals? How do tent-dwellers keep their food safe from thieving animals? How do they carry their tents from place to place?

5 Why do explorers, soldiers, and people who wander from place to place, generally live in tents?

6 "I am the most commonly used building material. You will find me somewhere in nearly every house roof. Though other building materials are usually found close by, I am sometimes carried hundreds, even thousands, of miles to be used. *What am I?* From what countries am I carried to Britain for buildings there?"

7 Fig. 33 shows houses built with cards. Build similar ones and try to design others. Can you build a two-storey house with cards? Why do card houses tumble down so easily?

8 In Fig. 23 there are two kinds of "lean-to", erected as additions to the cottage. For what purposes do you think they might be used? What advantages has the lean-to over a separately built shed?

9 The houses sketched on this page are from very different lands. What do the drawings tell you about the land in which each type of house is found?

10 Search your neighbourhood for old buildings and make sketches of them. For what were they originally used? What materials were used in their construction? Of what are local houses built today? What are the reasons for the change?

11 In some Welsh villages even today you will hear people speak of "Mr. Jones Post Office" and "Mr. Jones baker", of "Thomas carpenter" and "Thomas milkman". This was a common practice in England in olden days, and many of our modern surnames have arisen from it. Thus "Will the smith" became Will Smith, and "Richard the hunter" became Richard Hunter. The building trades have also given rise to many surnames. Make a list of those you find and add a note explaining the job to which each name refers.

12 Galvanized and corrugated steel sheets are used for roof-coverings all over the world today. Can you suggest why they are so popular? What disadvantages have they as roofing material?

13 Why have most English roofs got steep slopes?

14 Have you ever lived in a tent? If so, what were some of the things you had to learn about tent life?

15 House walls can be built of (*a*) irregularly shaped stones fetched from a beach or hill-side, (*b*) flat slabs of stone, (*c*) round logs of wood, (*d*) dried mud or clay. All are difficult materials to use. Why then are they used? How do the builders try to overcome the difficulties?

16 Quite simple cottages can be made more attractive in appearance by the use of differently coloured materials (bricks, stone and mortar), different arrangement of the materials, decorative woodwork and stonework. Find examples in your district.

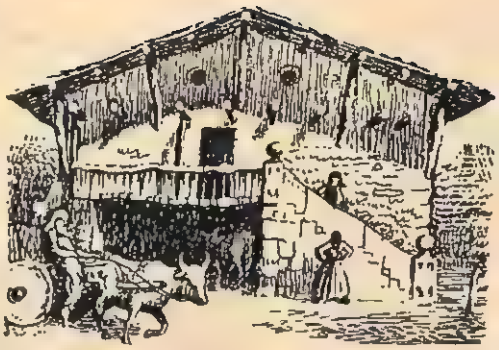


Fig. 34. A house in northern Spain.

Fig. 35. A native house in South Africa.

Fig. 36. A potter's home in north-eastern India.

Fig. 26. The solar window cut in the gable wall at the end of the great hall in an old manor-house. It gave light to the upper room. What would be the best direction for the window to face?

Fig. 27. A room in a fifteenth-century house. The joists, stretching from beam to beam, carry the floor-boards of the upper room. In modern houses they are hidden by the ceiling. What is the use of the ceiling?

MOVING UPSTAIRS

FOR long the whole life of the house was lived on the ground, enclosed by the walls and covered by the roof. You might sit on a stool and eat from a table, but you slept on the floor, even in the lord's manor-house. Then someone realized that planks stretched between the tie-beams would still leave ample room beneath the roof and provide a cleaner and more private space than the floor of the hall. The lady of the house and her daughters could carry on their spinning and tapestry-making and still overlook the servants at work in the hall below. The minstrels and musicians and play-actors (who entertained the lord's family at special feasts), could be placed up there too, where they would be more easily seen and heard than from the floor of the hall. In winter, though it might be more smoky, this loft was warmer and less draughty than the hall, a good place in which to sleep or to store food and tools.

The upper room had so many advantages that it soon became popular and steps were taken to overcome the difficulties that arose. The first need was to provide some way to reach the upper from the lower floor. A notched tree-trunk and then a simple ladder served the purpose and had the advantage that it could be hauled to the upper room at night. The stone staircase, at first an outside one, followed. Then came the wooden stair, as the carpenter's tools improved and his skill grew.

The darkness of the upper chamber was overcome by cutting a window in the gable of the house. Once the masons had learned to carve stone, this was often a beautifully shaped window in castle or hall or church. The sunlight falling through this high window so pleased the builders that the upper room was often called the *solar* or sun-room. In the cottage or farmhouse it remained simply a small opening in the wall which could be closed by a shutter or door.

When the upper room became a store-place,

as it often did in the houses of the working folk, this opening had another use. Sacks of grain or bales of wool could be put away there, or taken out, without having to be carried through the living-room.

If the tie-beams were far apart the planks forming the upper floor had to be thick, and therefore heavy, if they were not to bend beneath loads and thus make the floor uneven and dangerous. This was avoided by laying a few heavy timbers on edge from wall-plate to wall-plate and resting the floor-boards on these *joists* as they came to be called. If the joists were fairly close, the floor could be of quite thin planks.

To get rid of smoke was a more difficult matter. The one fire used for heating the home and for all cooking was laid upon a hearthstone in the middle of the hall. Even when dry logs were burned, there was a lot of smoke and this gathered in the house roof, of course. To cut an opening in the thatch or tiles was not a very good method. If the opening was large enough to let out the smoke, it also let in the rain, snow and wind. When coal fires came into use the problem was still more serious because of the nasty fumes.

Men found that the best solution was to build a chimney which collected the smoke and carried it away from the roof. In the wooden house a stone fire-place was built over and round the central fire and carried up through the roof. In the stone or brick house it was easier to leave a passage or *flue* in the wall and build the fire at the foot of the wall. A projecting hood above the fire helped to collect the smoke. In either case a warm sleeping-place was provided in the roof space near the chimney, and the children or servants could be sent off there to sleep. With the ladder removed they were safe till morning. In Norwegian and Swedish farmhouses the loft or attic is still used in this way.

The space beneath the hood was sometimes used to dry and cure meat or fish so that it remained fit for food for many weeks.

Fig. 28. The sleeping-loft round the great central chimney in an old Yorkshire farmhouse.

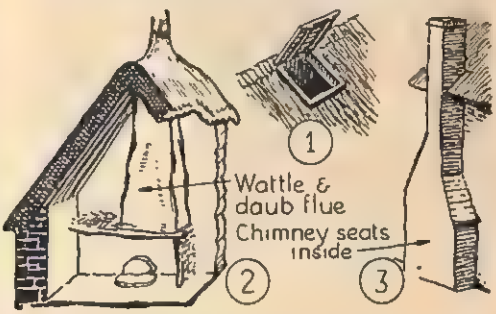


Fig. 29. How the chimney developed.
(1) The smoke-hole in the roof which could be closed with a wooden flap;
(2) Wattle-and-daub flue;
(3) Outside chimney-stack with a fire-opening inside large enough for seats.

Fig. 30. Worcester Cathedral carving showing a peasant warming his feet while supper cooks. His winter store of bacon hangs close by.

Fig. 37. A part of the plan for Harlow New Town Essex, showing some of its neighbourhood units and its road system. This was the kind of map Jim found.

FINDING A NEW HOME

"I'M going to tell you a secret, Jim, though I don't expect you'll be able to keep it for long. Mother and I are thinking of moving. We haven't settled just where we shall go, but it will be out towards the country, somewhere with a bus service to get me to and from work. You'd better go on finding out about houses, young man, hadn't you?"

Jim did not keep his father's secret for long. The very next morning he told it to Joe, and together they went searching for likely places for the new home. They had plenty of suggestions when plans were made for family trips for the same purpose on Saturday afternoon and Sunday. Several districts were looked over, but rejected for one reason or another.

If Dad was to get to work easily, his journey must not be too long and the home must be near a bus route. Mother wanted a house off the main road to avoid the noise and dust of the traffic, and she would like it to be away from the smoke and dirt of the factories. Dad was determined to have a garden instead of having to walk to his allotment. Jim asked for a place for a shed where he could amuse himself on wet days and a grass plot big enough for more attempts at tent building. Mother seemed most concerned about being able to do her shopping quickly, and reminded Jim that since he seemed to find it difficult to get up in time for school he had better make sure there was a school close by.

One week-end was not time enough to look at all the possible places, but during the following week Jim had what the family afterwards called a real inspiration. He remembered that his librarian friend had shown him a pamphlet about the Town Council's schemes for house building. He had not taken much notice of it at the time because the books about camping and about strange foreign houses had seemed more interesting then. Now he thought it might be worth looking at more closely, so off he went and borrowed it.

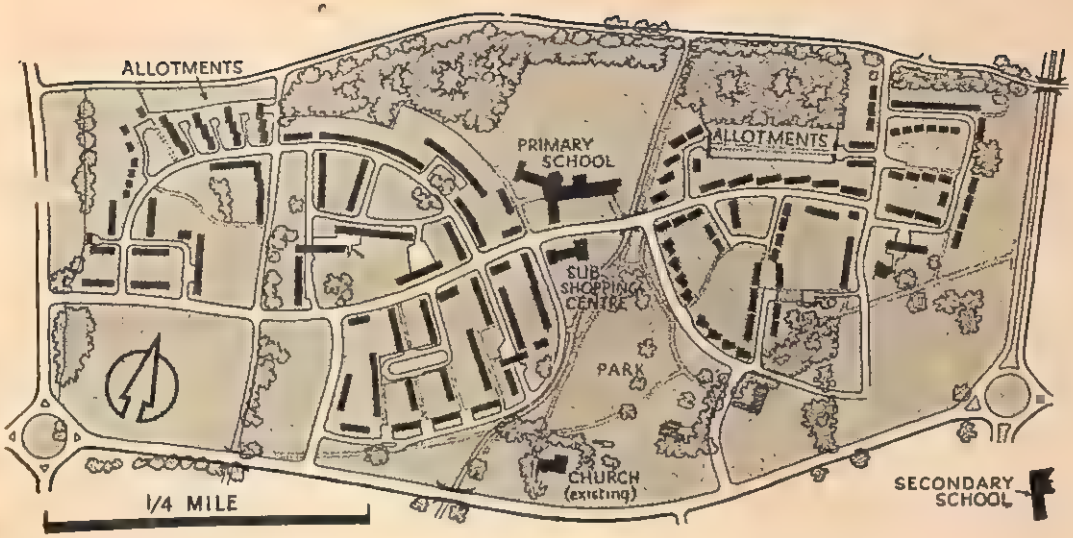


Fig. 38. A single neighbourhood unit. This is a plan of unit 1 in Fig. 37 drawn on a larger scale. It shows the buildings included in it and the open spaces round them. This was the kind of scheme drawn up for Millbank.

The little book had been drawn up by the Borough Surveyor and showed the plans the Town Council had made for developing the town. One section told where houses might *not* be built. No new houses were to be clustered round the factories, not even near the new factories. Other areas were to be left as parks and woods and fields, to form a green belt or green wedges as the surveyor called them. No one was to be allowed to spoil these pleasant places by putting up houses or shops. More surprising still, no one could erect buildings close to the main roads with their bus routes and heavy motor traffic. This pleased Jim's mother especially, and she remarked that there must be more sensible people on the Council than she had thought, though immediately afterwards she asked if there was anywhere left where people might build!

That set Jim to hunting for the coloured map the librarian had shown him. It was a map of the whole town and the land round about. Railways, factories and streets were shown in black, and so was some land to be kept for factory buildings only. The open spaces were coloured green, while red showed the areas available for houses.

The map showed five red areas on the high ground round the old town and in between the main roads leading out to the country. Each was to be the site of a *neighbourhood unit*, and separate plans showed how the Council proposed that each should be laid out. The surveyors had measured up the land, considered its slopes and shape and then designed the roads and plots, the best arrangement of its houses and the best positions for its shops and other buildings.

A visit to each of the units soon satisfied the family that Millbank was the place for their new house if they could arrange to have it there. Some new houses had already been built and others were in various stages of construction. From these they gathered new ideas for their own house and could see what sort of place they would be allowed to build.

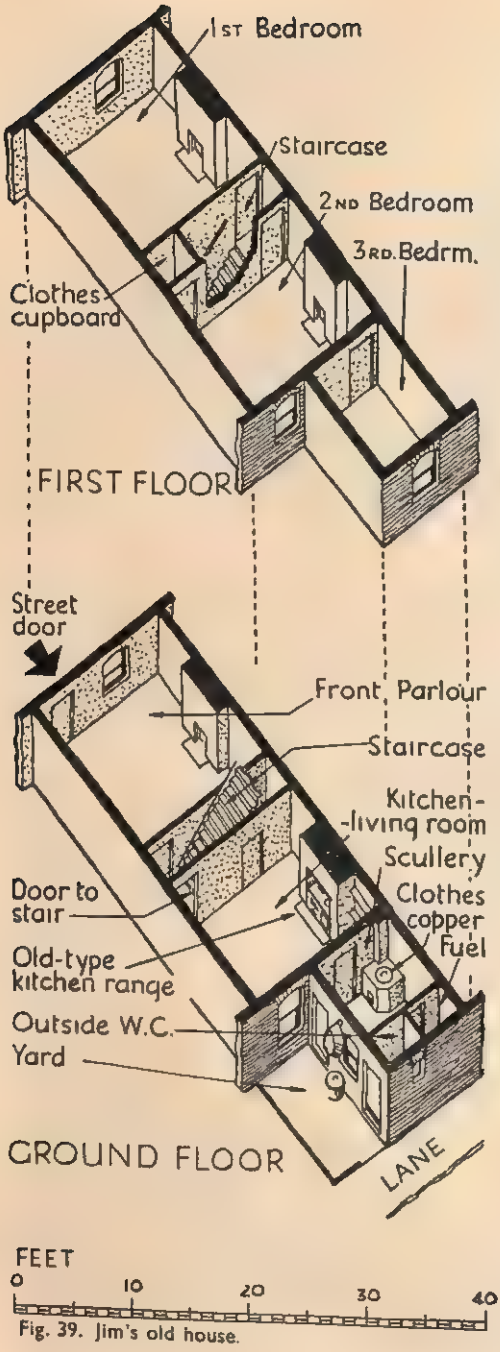


Fig. 39. Jim's old house.

PLANNING THE NEW HOUSE

ONCE the great decision to have a new house built at Millbank had been taken the family set about planning the kind of house they wanted. Dad had a talk with one of the officials at his work-place, a man who had just had a house built a little way out of town. It was rather a shock to both Jim and his mother to hear that they could not build just as they liked and that a licence would have to be obtained and detailed plans must be approved by the Town Council before a single brick could be laid. They saw they would need the help of someone who knew all the regulations and who knew too what were the best materials to use and how to fit what they would like into the small house they could afford. They found the man they needed in a local architect, Mr. Hodgson. He advised them to begin by making their own rough plans.

For a number of evenings the family sat round the kitchen table talking and drawing. Jim made a plan of the house in which they lived and with this in front of them, Mother soon pointed out what she wanted changed in the new house. She wanted a kitchen just big enough for her to do her necessary work and with plenty of light. They would have meals in a dining-and-living-room close at hand, and there they could sit in the evenings when work was done. Above all else she wanted a bathroom so that there would be no more washing in her kitchen or in the bedrooms. Jim wanted big windows because he liked the look of them. A window-seat, where he could lie and read without being in everybody's way, would be fine. Dad wanted a tool-shed big enough for bicycles as well as for his garden tools, and thought this and a coal-shed might be put close to the back door with a roofed space round them.

Jim had a fine time drawing plans to show what the family would like to have and was very proud of the sketches they finally took along to the architect. He was not quite so proud of them when the architect pointed out

some of the things he had overlooked, such as that staircases must not be too steep to climb and that fire-places should be arranged so that each does not require a separate chimney. He pointed out that these were some of the first things he had had to learn in his early training. But Jim's plans helped the architect to get a good idea of the sort of house they wanted.

The next step was to choose the exact site and find a reliable builder to do the work. Here again the architect could help with good advice, and through him they arranged to meet Mr. Stone at Millbank and choose with him the site for the house. The architect could then start preparing the plans for the Town Council and the builder, and drawing up what he called the *specifications*. Jim found out later that these were instructions for the builder as to the materials to be used in various parts of the work. Such things as the kind and colour of the outside bricks and tiles, the patterns of doors and windows, the kinds of wood for floors and staircases, the coverings for ceilings and inside walls, were all set out in the specifications as well as the sizes of timber and fireplaces, sinks and drains.

From the plans and specifications the builder would work out the price he must charge. He could then order the materials he would need and make sure they would be there when he was ready for them. He and his men would not be able to do all the kinds of work needed, so he had arrangements to make with such people as painters and plumbers and electricians. He could supply them with particulars of what they were to do and find what their charges would be. These would be included in his estimate.

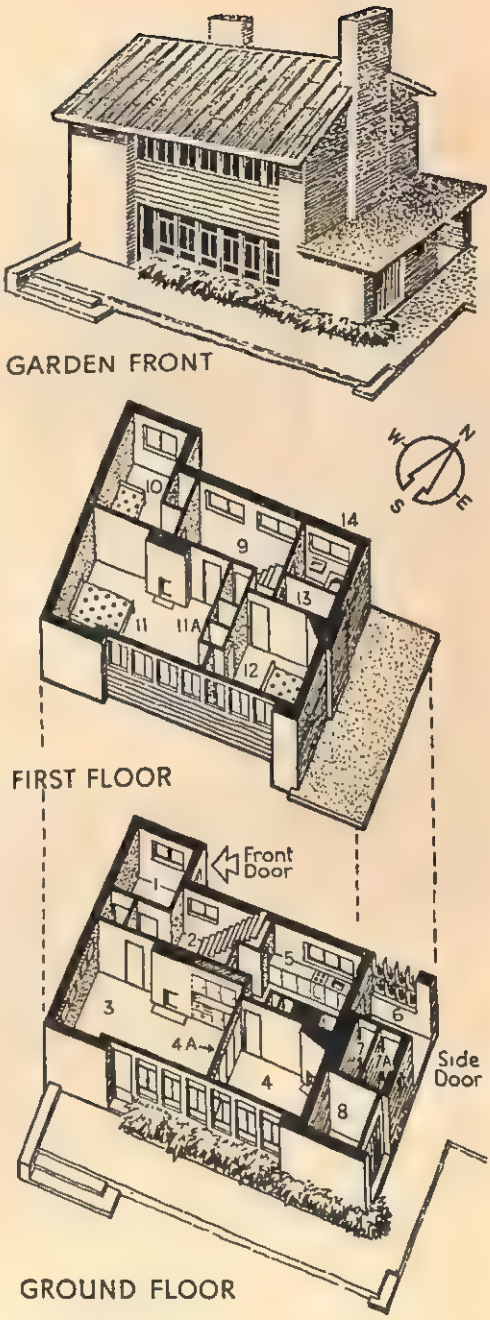


Fig. 40. Jim's new house.
1. Lobby and pram space.
2. Staircase and hall.
3. Living space.
4. Dining space.
4A. Folding partition.
5. Kitchen.
6. Covered yard.
7. Coals.
7A. W.C.
8. Tool-shed.
9. Staircase and landing.
10. 11. Bedrooms.
11A. Cupboards.
12. Jim's bedroom.
13. W.C.
14. Bathroom.

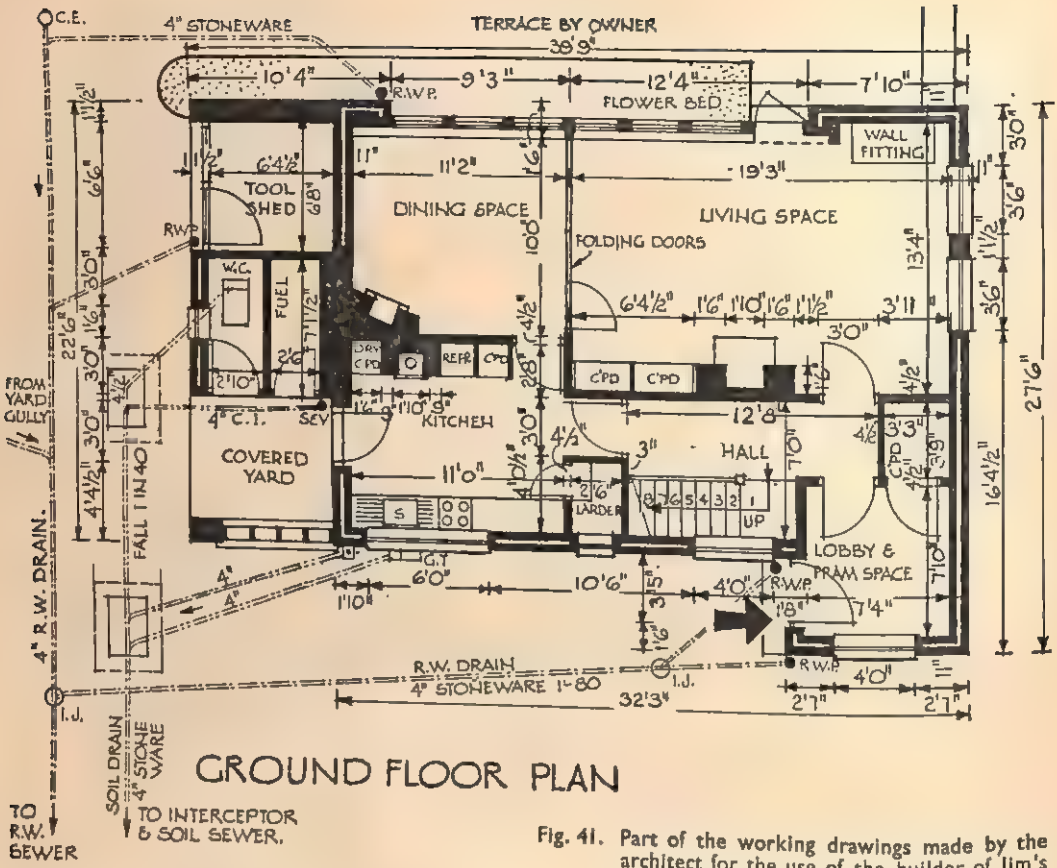


Fig. 41. Part of the working drawings made by the architect for the use of the builder of Jim's new house. These are made on transparent glazed linen. Why not on paper?

1 The ground-floor plan was drawn on a scale of $\frac{1}{8}$ inch to 1 foot but has been reduced to half size. What is its scale now?

2 Find the overall length of the house. Check your answer by finding the length by a quite different method.

3 Trace on the plan how (*a*) rain-water from the street half of roof, (*b*) rain-water from the back half of roof, (*c*) waste water from kitchen sink and bath, reach the sewers in the street. What is meant by the lettering FALL 1 IN 40?

4 Is the area of the living space more or less than 260 square feet?

5 What are the dimensions of Jim's bedroom?

6 Does the door from the kitchen to the dining space open into the former or into the latter? At which side is the door fastening—on your left or right going from the kitchen?

7 Which of the following have windows: the lobby cupboard, the larder, the fuel space?

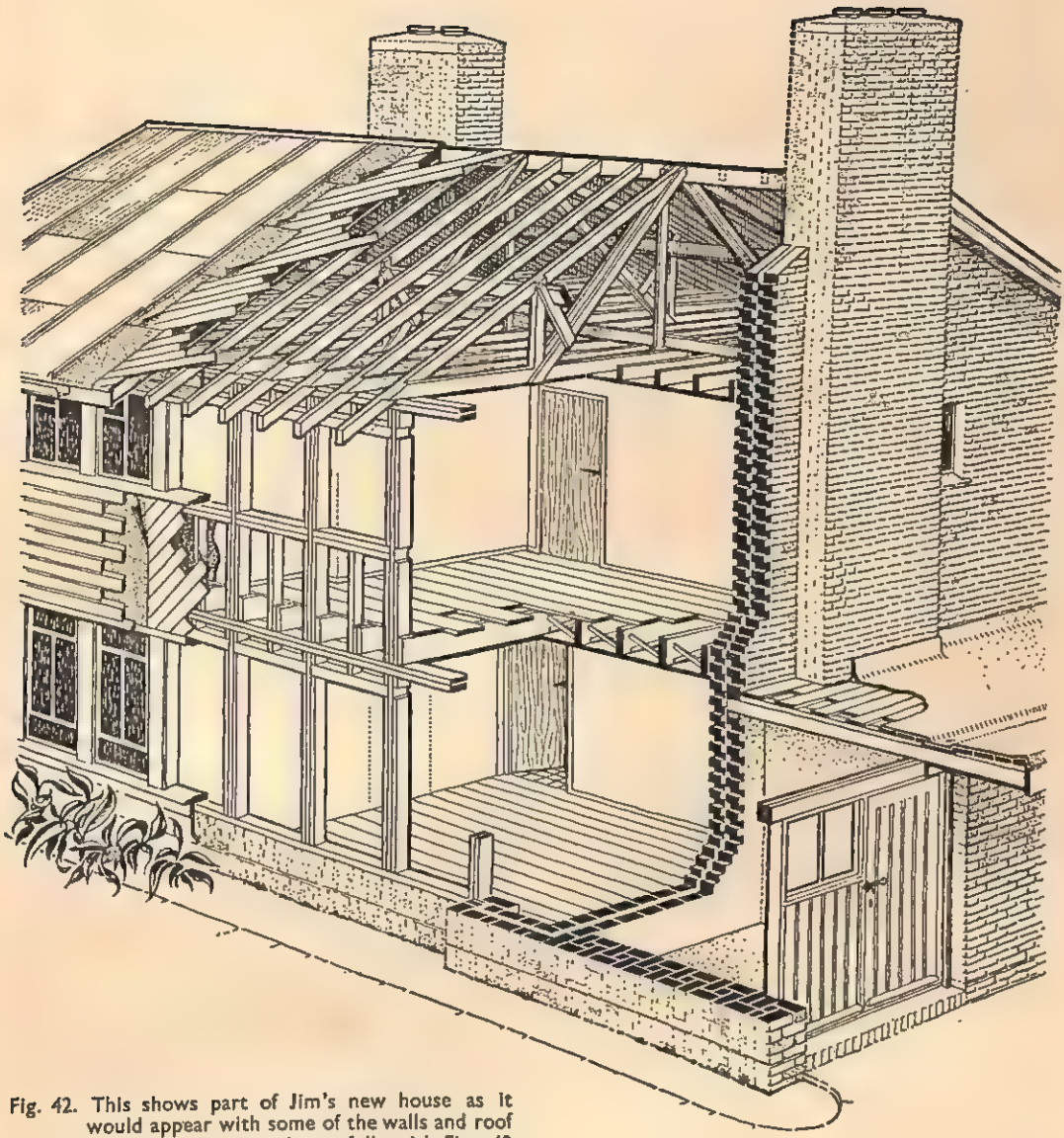


Fig. 42. This shows part of Jim's new house as it would appear with some of the walls and roof removed. Compare it carefully with Figs. 40 and 41. Name each room shown. Examine the structure of the roof and the wooden framing for the garden front wall with its many window-spaces. Which of the carpenter's work on these would probably be done on the site, and which in his workshop?

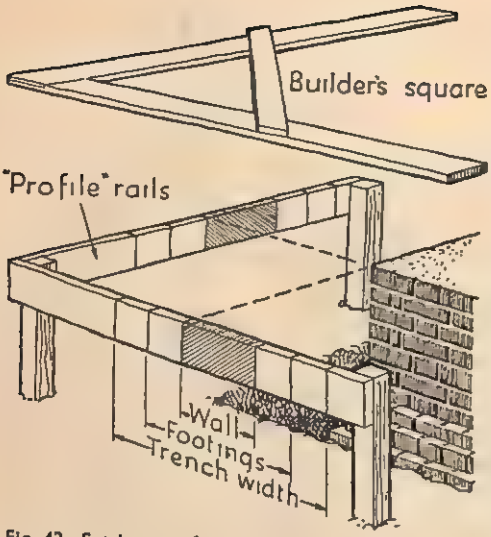


Fig. 43. Setting out foundations with profile rails

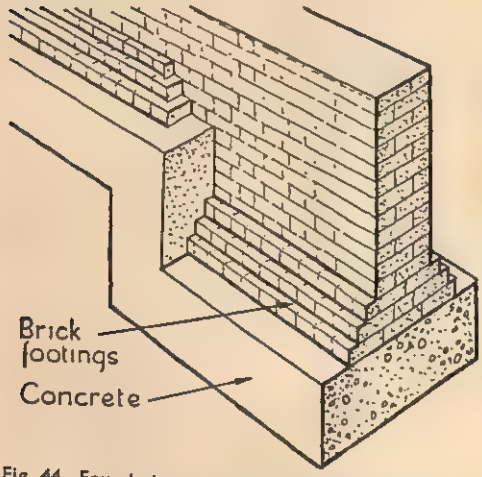


Fig. 44. Foundations in sloping ground. In order to show how the wall rests on the concrete base, the walls of the trench are not shown

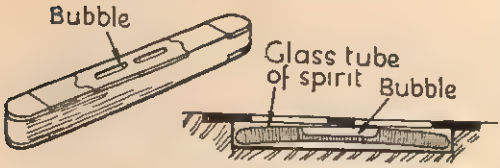


Fig. 45. Explain how a spirit-level works

WHAT SHALL WE BUILD ON?

A FEW weeks later Jim's father heard that the Council had given its permission, and that the builder had signed the contract to build the house for the price agreed upon. Work was to begin at once. The site chosen was on gently sloping ground, well drained and dry. Jim wanted to know how the work of building a house was begun, so he hurried along after school to see. He found the builder at the site and he was quite ready to explain.

"I found from the plans the measurements of all the walls and got my carpenter to make these profile rails and pegs for me. The lines painted on the rails show the widths of the trenches we have to dig, and of the concrete foundations and the walls that stand on them. We had to be careful to set out the corners correctly with that big square.

"I am just going to check this corner to make sure it is quite square and to do it I will use the old 345 rule that some builder discovered a couple of thousand years ago. You can give me a hand and see how it is done."

Jim held one end of Mr. Stone's tape-measure at the corner of the trench whilst he measured three yards along the side of the trench and marked the place with a peg. He then marked in the same way four yards from the same corner along the other trench. When they measured from peg to peg across the corner and found it just five yards, Mr. Stone said that proved the corner was square. He told Jim that he had learned this rule in his geometry lessons at school but never realised how useful it was till he started building houses. He then went on with his explanation of the work to be done.

"The outside walls are to be eleven inches thick and the inside ones four and a half inches. They must rest on firm *foundations*. I expect you remember what happened to the house built on sand! We cannot build on solid rock here, but we do the next best thing—lay a wide concrete foundation. The

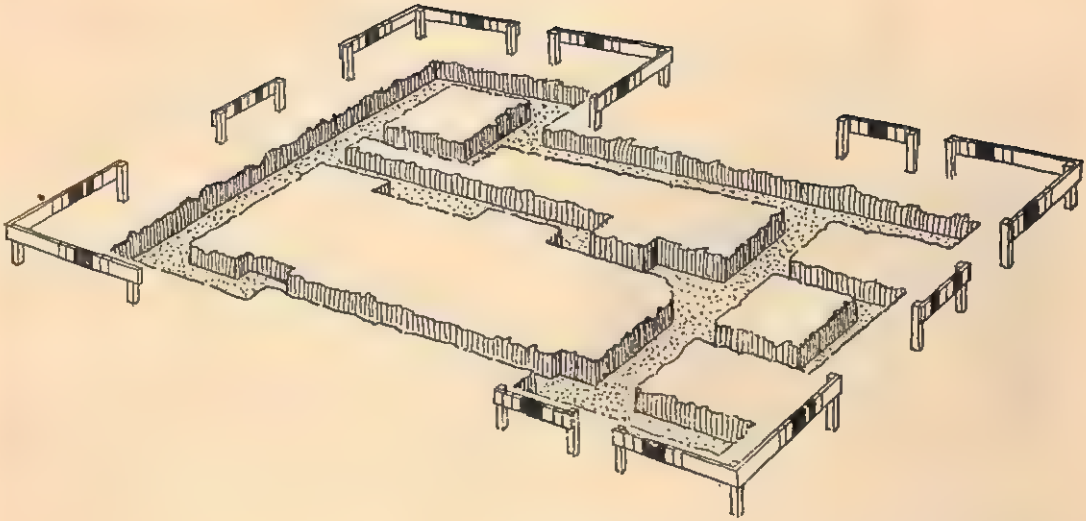


Fig. 46. Ready for the bricklayers. Profiles have been erected, trenches dug and foundation concrete poured into them.

labourers are digging the trenches for it now. They will have to be deeper on that side where the ground is higher so that the top surface of the concrete can be kept horizontal. Somebody will be along from the Council Offices before we finish that work, just to see we have kept to the building line. The Council regulations say that all new buildings must be kept back at least a certain distance from the middle of the road, and they see that we do it."

When Jim next visited the site he found that all this had been done and that the men were mixing concrete and putting it into the trenches. He soon noticed that everything was measured that went into the mixture. A wooden box was filled four times with broken rock and brick, twice with sand and once with cement and all these were turned out in a heap on a wooden platform. The labourers turned this heap over and over again with their shovels until it was thoroughly mixed. Then they added water, a little at a time, and kept on turning the heap until all the mixture was evenly wetted and just pasty enough to stick together.

Jim was surprised to find how heavy this stuff was when he tried to fill one of the wheelbarrows in which it was taken to the trenches. He understood then why the men wished the job had been big enough to bring the machine-mixer along.

Over on the site he saw what was being done in the trenches. A good thick layer of concrete was spread in each trench and was roughly levelled with a shovel. Then the workman in charge smoothed off the upper surface and checked that it was level, both from side to side across the trench and also along the trench. He did this by means of the smoothing-board and a spirit-level. Jim would have liked to ask him how the latter worked, but he seemed too busy to interrupt then, so he saved his question to ask on another day.

Fig. 47. Cotswold cottages. Walls and roofs are of stone from local quarries.

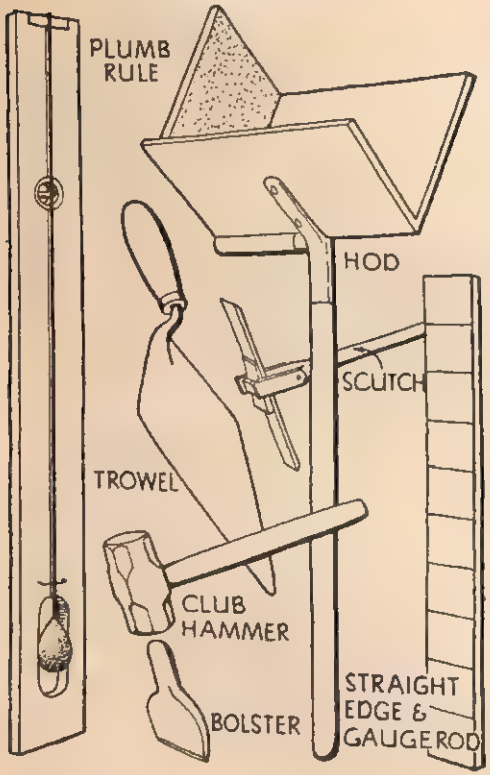


Fig. 48. The main tools of the bricklayer. Find out the purpose for which each is used.

BRICKS AND BRICKLAYERS

JIM and Joe spent much of their time in the next few weeks in and about the building site. They found that old Sam, the foreman bricklayer, was quite friendly so long as they kept out of the way when he and his men were busy. At meal-times, or when a shower of rain drove them all to shelter in the builder's hut, Sam told them lots of things about his trade.

"When I was a lad of thirteen I started work with a mason in our village in the North. We were all masons there, not bricklayers, for we built with stone from the quarries, not with bricks. It was slower work but more lasting.

"Some of the cottages we built then will be standing long after these brick places have tumbled down, and I still think they look better too—homely, comfortable places, warm in the winter and cool in the summer because of their thick walls. Mind, there was a lot to learn about the job and it was heavier work than bricklaying too. You had to have your wits about you to pick the right-sized stone to fit next in the wall so that you got both a strong and a good-looking job. It was hard on your hands, and on your arms too, when it came to dressing the stones for the wall corners and to fit round the door-frames and the windows.

"Sometimes, if you were good with a chisel and mallet, there'd be a chance to put in a bit of fancy work round the windows or above the doors. But that is all just about finished now. Most of the old masons have had to turn into bricklayers that just put one brick on top of another all day long.

"Not but what there's things to learn about bricklaying, mind you, as you youngsters will find out if you keep your eyes open. There's good bricklayers and poor ones.

"I guess you have wondered why folks use bricks nowadays if stone is so much better. Well, I'll tell you. To begin with, there are some parts of the country where there is no good stone to be had. Quarrying costs money, too, and stone is heavy, awkward and costly to

carry about the country. You can dig the brick-clay by machinery and the cheapest coal is good enough to burn bricks. You can make all the bricks in one size too so that we don't have to stop and turn them over till we find one to fit. Then the standard size is just right for picking up in one hand, and you don't need to put down your trowel every time you put one into place. All those things make building in brick quicker and cheaper.

"Did you know that bricks can breathe? Well, they can, and it is one of their good points too. If you look at that brick and feel it, you can soon tell that it is as full of holes as a sponge. Every one of those holes is full of air. When the rain drives against a brick wall the water doesn't run off it in streams and soak the ground all round the foundations. Quite a lot will soak into the bricks and dry out from them again with the sun and wind.

"The same thing happens inside a house. When the glass windows are streaming with water on a winter wash-day, the walls will be quite dry because the plaster and the bricks can absorb the moisture from the steamy air and the glass cannot. So you see, laddie, there's lots to learn, even about bricks."

One of the labourers had worked for a time in a brickworks, and he told the boys how bricks were made. In the lowland parts of Britain are thick beds of clay which can be ground into a paste with water. The best bricks are made by hand. A lump of the clay is pressed into a wet metal mould of the correct shape and size. It is then shaken out and taken away to dry on a heated floor. In the next stage the dried bricks are stacked in great ovens, where they are burned in the flames of coal fires. This leaves them hard but still porous.

Wire-cut bricks go through just the same stages of drying and burning, but in their case the wet clay is squeezed from a machine just as you squeeze toothpaste from a tube. The clay is cut to the proper size by a wire stretched across a frame.

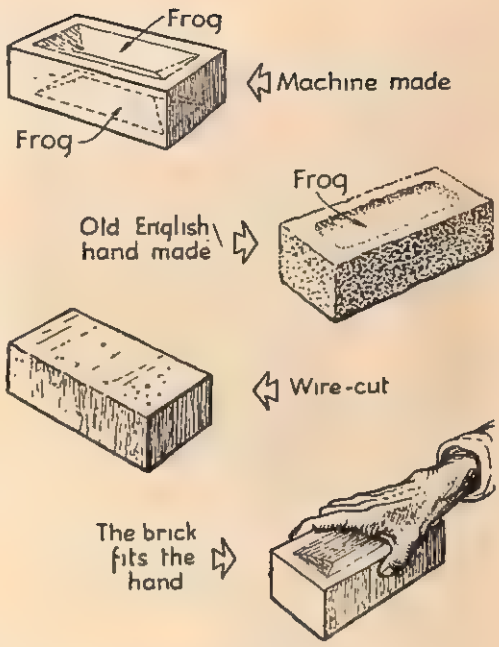


Fig. 49. Common bricks. What is the use of the frog?

Fig. 50. How London gets its bricks.

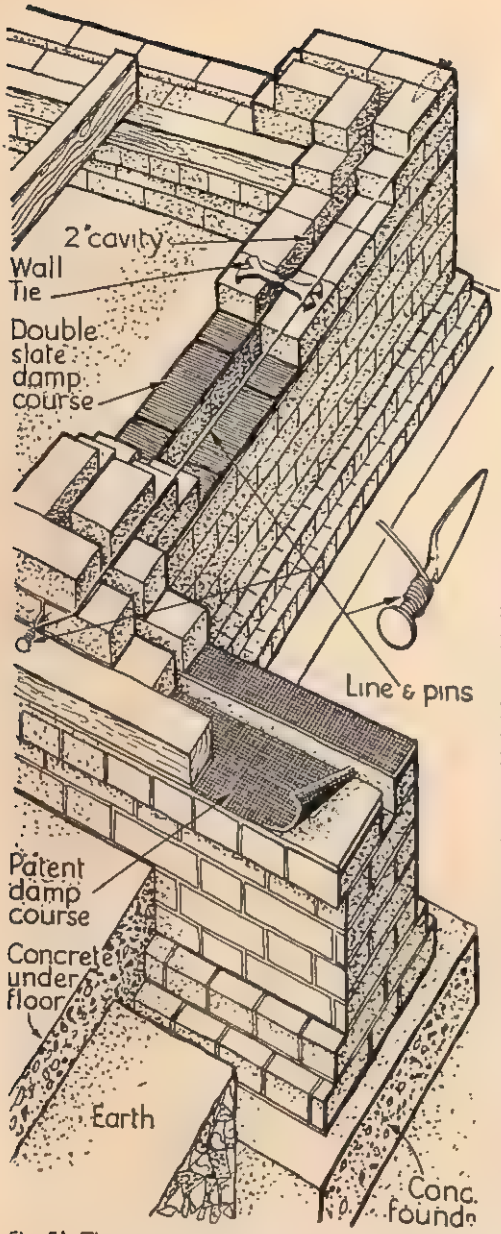


Fig. 51. The cavity wall is built on the wall footings. Two kinds of damp-course are shown—slates, and lead foil between damp-proof felt. Notice also the iron ties and the way in which the line and pins are used.

BUILDING THE WALLS

AS THE days went by, the boys learned more of the bricklayers' work and how much it had to do with the comfort as well as the appearance of the finished house. They were constantly making discoveries, such as that a layer of slates or strip of lead was built in the brick wall just above the ground level. Sam told them that this *damp-course* was put in so that the porous bricks would not soak up water from the earth and so make the house walls damp. Old houses without damp-courses of this kind nearly always show patches of faded wall-paper or crumbling plaster.

They also found that the outside walls were double, really two walls with a space between. Sam explained the importance of this. The air or cavity in the double walls helps to *insulate* the rooms; that is, it keeps out winter cold and summer heat and keeps in the heat from the fire. It keeps the inner wall drier too and lessens the noise from traffic in the street. Sam also told them that in very cold lands, such as Russia and Canada, the windows too are usually made double for the same reasons.

A talk with the labourer taught them something about the mortar that was used to hold the bricks firmly together and fill up the spaces between them. He made it by thoroughly mixing one bucket of cement with three buckets of coarse sand and then wetting it with water and mixing again until it was just the right softness all through to be easily handled by the bricklayer with his trowel. He explained that until fairly recently mortar was always made with lime instead of cement, and some builders still used lime and cement together. Cement is more costly, but it sets more firmly and resists the weather much longer.

One day Sam came over to them when the boys were amusing themselves by stacking bricks that had just been dumped from the lorry. The wall of bricks they had built was already nearly toppling over, though it was less than a yard high. "That," said he, "is because

you haven't *bonded* them. You take a look at the way we fix the bricks in the wall, and then make me a stack that won't fall over when I look at it." They soon found out what was wrong—they had arranged all the bricks to lie in the same direction instead of crossing some of them, and their bottom rows were not level.

At lunch-time Sam gave them a lesson in bricklaying. There were, he said, four rules for building strong walls:

1. *Keep the wall straight.*
2. *Keep it plumb.*
3. *Keep the courses level.*
4. *Watch your bond.*

For the first three rules the bricklayer has tools to help him. He builds up the ends or corners of the wall first and then stretches a cord tightly between pins stuck in the end portions. This gives him a straight line for the front face of the wall. The plumb-line hung on its board tells him when he is getting the wall out of the vertical or *out of plumb*, as Sam called it. The spirit-level laid on the edge of a board resting on the newly laid bricks tells whether they are level or not. A tap with trowel or hammer whilst the mortar is soft puts things right.

The bond must be learned and remembered. It is simply the pattern in which the bricks are arranged and varies with the kind of wall being built. Some of the bricks are placed end-on to the face of the wall so as to bond or tie together the front and back sections. In the double outer walls, or cavity walls as they are called, metal ties are placed to serve this purpose.

The boys were surprised at the speed with which the workmen could lay the bricks. The labourer kept them supplied, carrying both bricks and mortar in his hod. They soon realized what a really handy tool this clumsy-looking thing was. They saw, too, what Sam had meant when he said there were things to learn about bricklaying. The mortar picked up on the trowel each time was just the right amount to form the bed for one brick, with a little over for the end. The tap of the trowel brought it to the level of those previously laid.

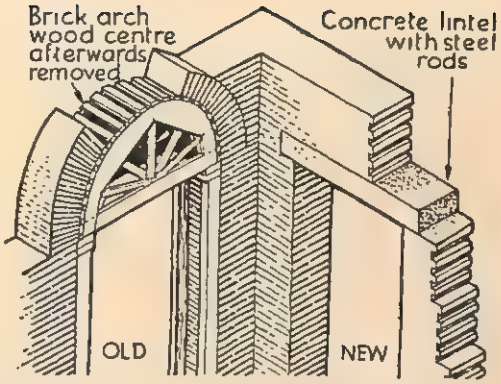


Fig. 52. Old and new ways of bridging an opening in a brick wall.

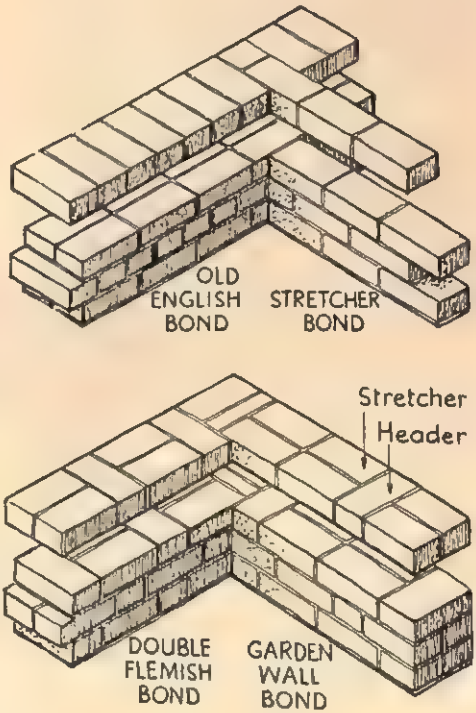


Fig. 53. Bonds used in brick walls. Why are the lower bonds not used in cavity walls?

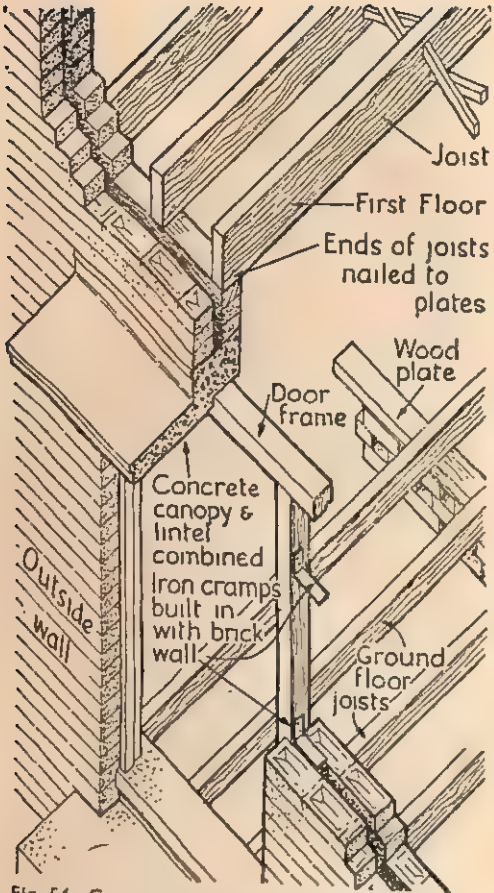


Fig. 54. Carpenter's work as the walls are built.

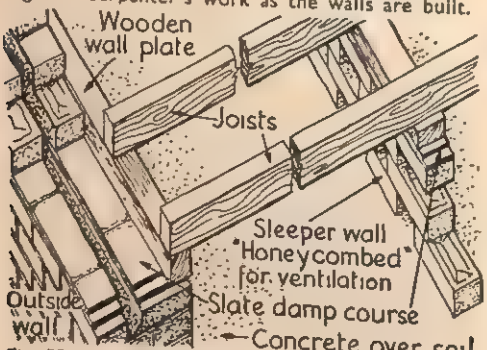


Fig. 55. How ground-floor joists are supported. Why are the joists placed (1) on edge; (2) with their ends above the damp-course? What is the use of the sleeper wall?

THE CARPENTER GETS TO WORK

"THE more I see of house-building," said Mr. Whitehouse to the builder, "the more I see the importance of good teamwork."

"That is absolutely true," replied Mr. Stone. "It's a bit like a cricket match, except that I have to captain both sides! I had to have the carpenter all ready to go in to bat today or the bricklayers would have been sitting about the field, and the spectators—that's you and Jim here—would have been shouting at us to get on with the game. The floor joists came a few days ago and the carpenter started putting them in this morning when the walls had been built up to floor level. The architect came along this afternoon, too, to see they were properly fixed. I expect you noticed their size, about seven inches by two inches, and I'm sure Jim could tell you why they were put on edge and not flat. What Mr. Hodgson was particular about was that we put them as close together, about fourteen inches, as he had laid down in the specifications, and with a good four inches resting on the wall at each end. You could save timber by using smaller sizes and spacing them more widely but it wouldn't give you as strong and stiff a floor.

"You can see we have kept the floor joists clear of the ground and above the damp-course, and have put air-bricks—those chaps with the holes through them—in the walls so that the undersides of floor and joists will be kept dry. Damp timber rots quickly, so when you get busy with your gardening mind you don't block up those air-bricks, Mr. Whitehouse, or one fine day you'll find a chair-leg going through the floor!"

Jim saw many other examples of teamwork between carpenters and bricklayers as he watched the house rising. The window-frames and door-frames had been made in the carpenter's shop, and he was there to fix them in position when the workmen were ready to build

the walls round them. The joists for the upper floor were cut and fixed when the walls were at the right height for them. They were not so heavy as those used for the ground-floor.

Later, floors would have to be laid on the joists, and doors and windows would have to be fitted into their frames. Both joists and frames had to be fixed properly now, or there would be unending trouble later. That explained the care the carpenter took in spacing and levelling the joists, and in getting the frames square and plumb and secured so that they could not be shifted accidentally as work went on.

Just as with the bricklayers, problems cropped up that Jim had never expected. One of these puzzled him a good deal. There had to be a space in the upper floor—the carpenter called it the *well-hole*—where the staircase reached it, and that meant a big gap in the joists. Whichever way they were put some of the joists could not rest on the outside walls. Then, too, it looked as if the ends of some of the joists would have to be cut off and left without support where the hearths for the upstairs fire-places came. But the carpenter had met such problems before and knew just how to solve them by what he called framing the joists round the gaps. Fig. 57 shows how this was done.

When Jim had tried simple carpentering jobs at home he had had great difficulties with corners. Even when he had got them square they would not stay square. The carpenter had this problem to tackle too and when the lads helped him to unload door- and window-frames sent up from the workshop they saw how he solved it. As soon as the two sides were truly placed according to his steel square he nailed a strip of wood across the corner. He showed them that as long as the nails held and the strip was unbroken the corner could not be forced out of shape. "When we put on the roof you'll see us do the same thing with corners that are not square," he told them.

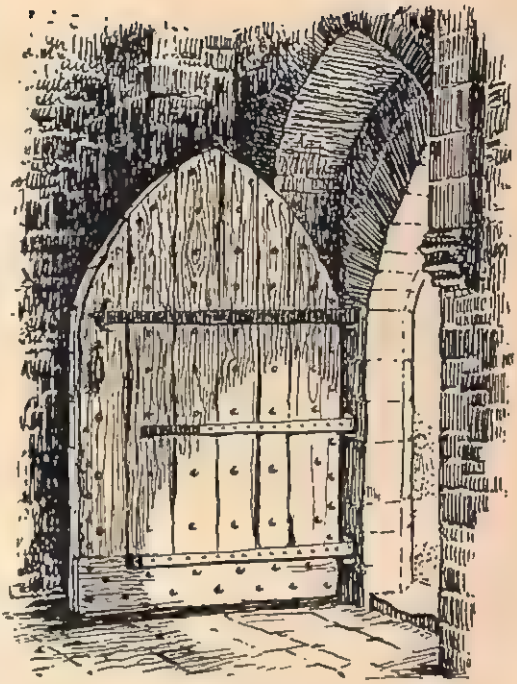


Fig. 56. A door made 700 years ago. It is two layers of planks fastened together with wooden "nails". Note that it does not fit into a frame, but covers the opening and is hinged directly to the wall.

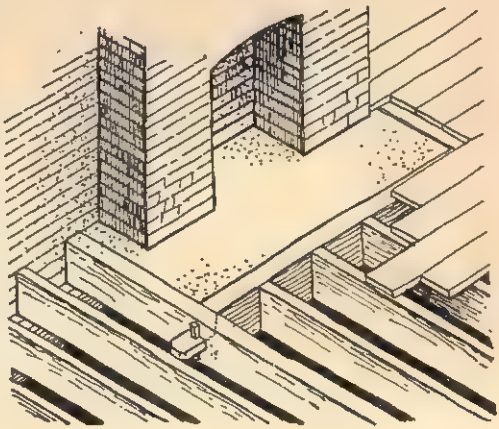


Fig. 57. Floor joists framed round a hearth.

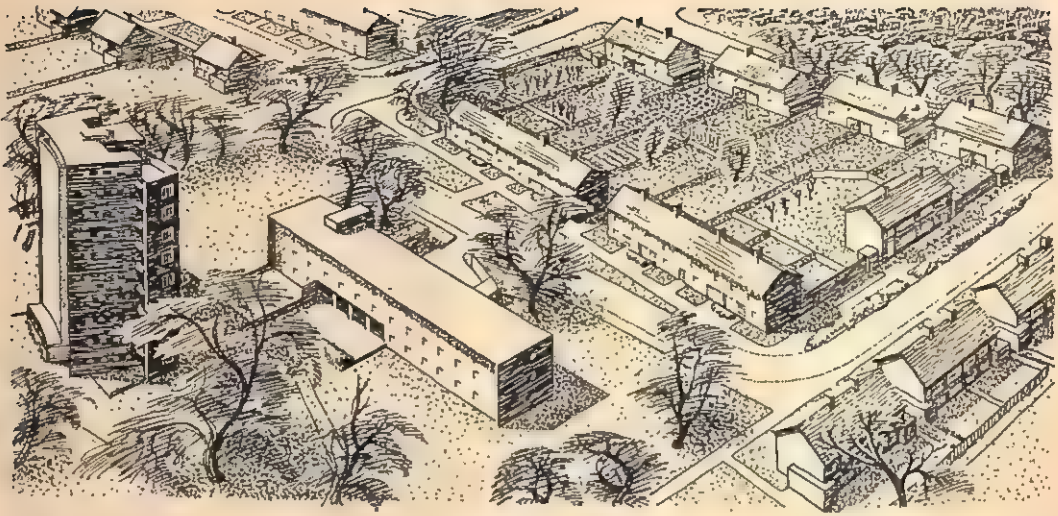


Fig. 58. Houses and flats in Harlow New Town

1 Look again at the town plan on page 16. Why are the industrial areas put near the railway, the river and the main highway? Why are the residential neighbourhood units put between and not along the main town roads? What buildings would you expect to find in the town centre?

2 Why would you choose a house site on sloping ground rather than on flat ground? Would you choose the higher part of the town or the lower part?

3 Some people prefer flats to self-contained houses. Which do you prefer? Why?

4 Fig. 58 shows how different types of home are to be grouped together in Harlow New Town. How many kinds can you find? Which do you think best for (*a*) a young husband and wife; (*b*) an old couple; (*c*) a family with children? How should the open spaces be used?

5 Some boys have carved interesting models such as hearth and garden ornaments, book-ends, door-stops and so on, out of old fire-bricks with a hammer, a small chisel and an old file or two. See what you can do in this way or try it with blocks of stone or wood. Figs. 59 and 61 should help you.

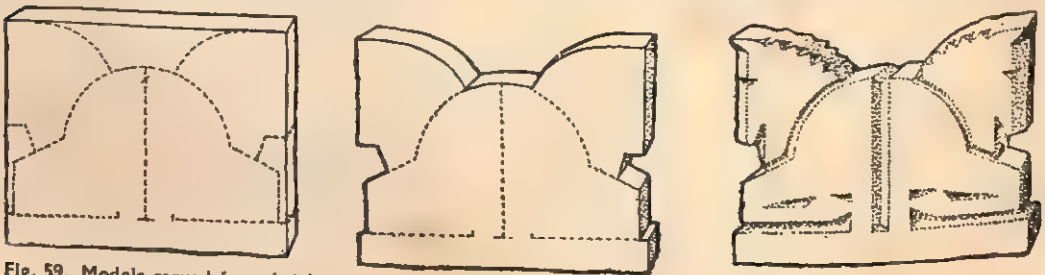
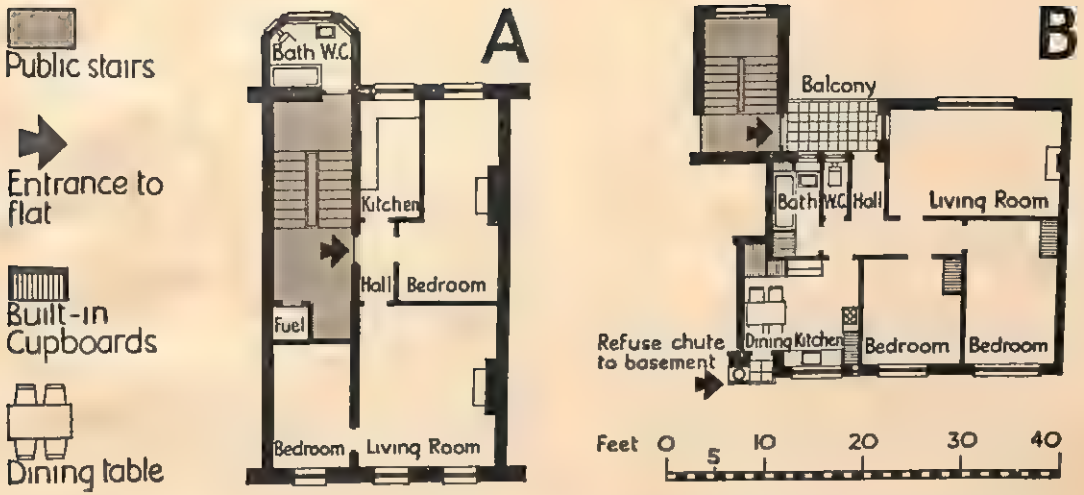


Fig. 59. Models carved from bricks.



(Redrawn from the Ministry of Health Housing Manual 1949, by permission of the Controller of H.M. Stationery Office.)

Fig. 60. Poor and good flats.

6 In Fig. 60, *A* shows the floor plan of a flat in a converted four-storey town house. *B* is the floor plan of a properly designed new flat covering the same space. In what ways is *B* better than *A*?

7 Make a list of the things you think wrong in the planning of Jim's old house shown on page 18. Can you improve on the plan of Jim's new house shown on page 19?

8 Make a simple wooden mould suitable for casting small square tiles. Try mixtures (*a*) of all cement; (*b*) 1 of cement to 1 of sand; (*c*) 1 of cement to 3 of sand; (*d*) 1 of cement to 6 of sand. How do the blocks differ? Which mixture is strongest?

9 Explain how to use a spirit-level. Which is better for building work: a four-inch or a sixteen-inch level?

How do you use a plumb-line?

To what points would you pay special attention when preparing a plank for use with (*a*) a plumb-line and bob; (*b*) a spirit-level?

10 Why does the mason prefer a round wooden mallet to a steel-headed hammer for stone-dressing?

Concrete blocks are now often used instead of dressed stone. What are the reasons for this? Find how the blocks are made. Why are they frequently painted?

Fig. 61. Old carved figures

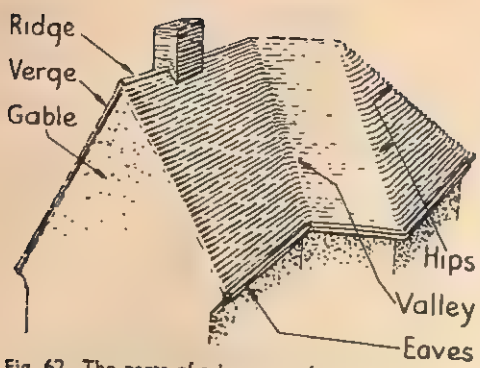


Fig. 62. The parts of a house-roof.

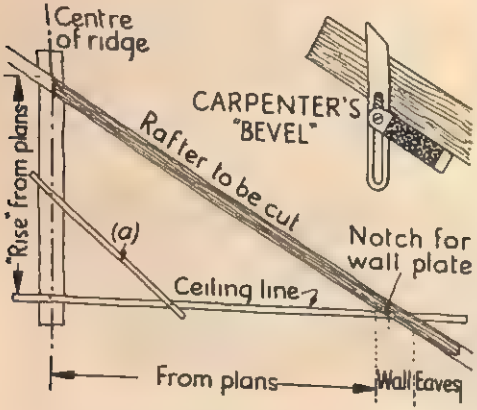


Fig. 63. Marking off rafters. Why is the lath (a) nailed across the angle? Notice how the bevel set to the correct angle from the first rafter can be used to mark off all the others.

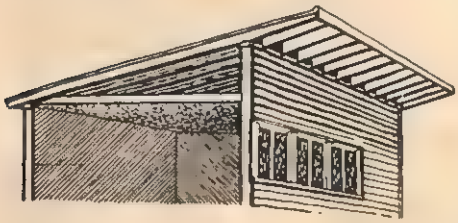


Fig. 64. A new type of roof. By carrying the rafters well out, rain is kept from the windows. Over-shadowing is lessened by keeping the roof up from the windows. On a low-pitched roof such as this, tiles are not suitable, so copper or zinc sheeting is used instead.

PUTTING ON THE ROOF

HAVING learned something about the importance of the house roof and its history, the boys were particularly interested when the stage of roofing the house was reached. The architect pointed out some new facts about roof building when they met him on the job one day.

"Most people only think about a house roof when rain comes through it! At other times they forget all the care that has been taken to make a roof watertight. Since it cannot be made in one piece, the builder's first care is to see that all the pieces—tiles, slates, metal sheets or whatever he uses—overlap one another. The roof timbers must be strong too, or the weight of the roof will cause them to bend and so open the joints.

"I am surprised so few people notice how much the appearance of a house depends on its roof. In Britain they are nearly always made in the shape of a V turned the other way up, because their main use is to run off the rain quickly. But how steeply shall we make them slope or pitch? I think that high steep roofs on small houses make them look as foolish as tall hats on small boys. Then the colour of the roof should be considered too. Blue slates on red-brick walls seem all wrong to me. For a single house, or even a pair in one block, I like what the builder calls a *hip-roof*, but the rectangular plan of this house is suited by a simple span roof."

The boys went off to find the carpenter. They found him aloft on the scaffolding. He had gone up to see that the wall-plates, which he had cut the day before, had been nicely bedded down with mortar. They watched for a while as he and his mate raised the ridge-piece and fixed it in place with the first pair of rafters. Remembering what the architect had told them, they understood why these timbers were set on edge. Joe, however, had a question to put to the carpenter when they were on the ground again. He was keen on woodwork at

school and knew something about joints and had noticed that the rafters were just the right length and cut to the correct angle to fit the ridge-piece at the top. How had the carpenter managed this?

"You certainly use your eyes and your wits, youngster. Perhaps there are lots of ways of doing that job, but I know three and they've been enough for me so far, though I've had to work out some queer-shaped roofs in my time. At first I used to work it out on the ground. I put down a joist, or maybe two joists end to end, and marked the width between the walls. Then I laid down another at the middle and marked off on it the height to the ridge. Then, when I laid a rafter across from where the wall-plate would come to where the ridge was to be, I marked the top angle on it and cut it to the proper fit and length. The others were just copies of that one, of course. When I had set my bevel to the top angle of the first rafter I could use it to mark off all the others.

"I *could* have worked it out, and so could you, by drawing the whole thing on some paper, but a new building isn't the best place for that kind of drawing, is it? If it's an awkward roof with hips and valleys I still draw it at home, though, before we start cutting. Generally I work it out on the job with my square when I've taken off the measurements from the plan and found out how many inches the roof rises for each foot across from wall to wall. If it is, say, twenty feet across, and the ridge is five feet above wall level, that is a five-foot rise in ten foot width or six inches for each foot."

In the following days the boys watched the roof timbers going up and the tiler covering the framework prepared for him. Had timber been plentiful a roof of boards covered with felt would have been made first and the tiles fitted over it, but the under-roof is now often omitted. The boards help to keep out winds that find their way beneath loose or badly-shaped tiles. The felt, like the air gap in the cavity walls, is an insulator against summer heat and winter cold.

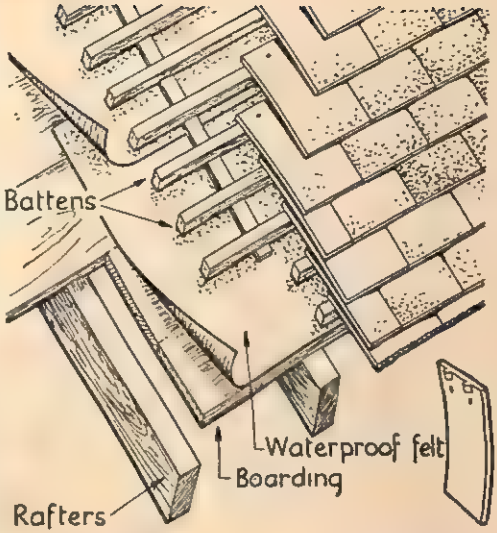


Fig. 65. A good roof with plain tiles. The "nibs" on the back of the tile hold it in place on the batten, and only every third tile needs nailing. Note that there are at least two thicknesses of tile everywhere.

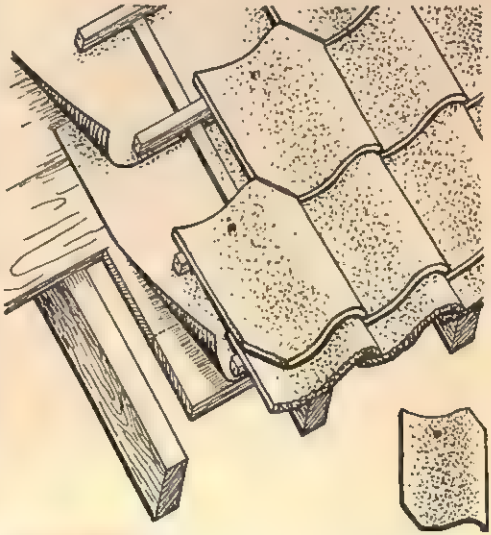


Fig. 66. A pantile roof. The tiles usually have one nib on the back. Every tile is nailed. Except at overlap there is only one thickness of tile.

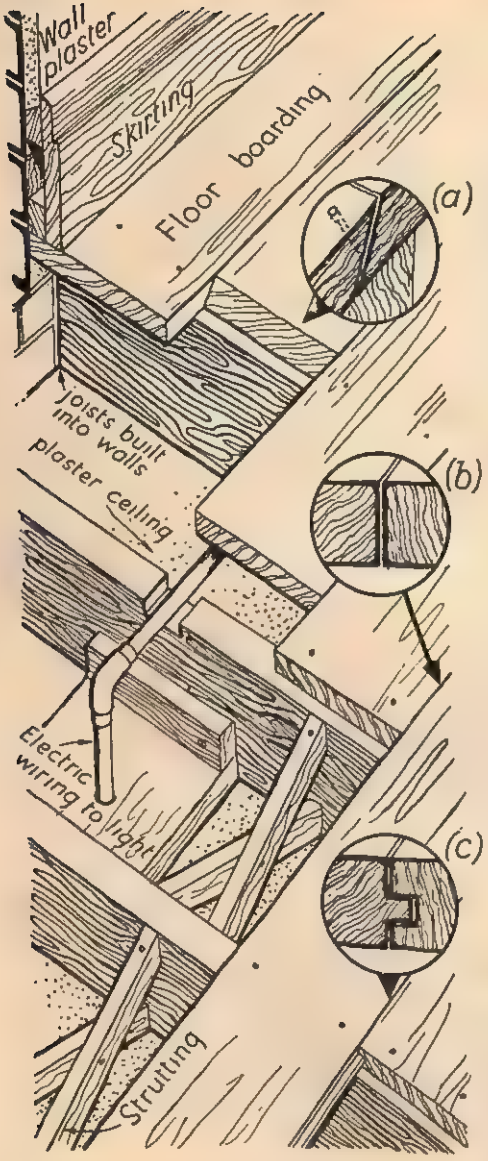


Fig. 67. (*a*) How ends of floor-boards are joined. (*b*) Planks with plain edges, used for floors of hardwood. (*c*) Tongue and groove, always used for softwood floors.

FLOORS TO WALK UPON

WITH the roof safely fixed and covered, the fitting and finishing of the interior of the house could go on without interference from the weather. The carpenter now became the most important man in the house-building team. He had two principal tasks to carry out: the fitting of the floors, and the fixing of things to the walls. The electrician had wiring to do, and the plumber had water- and gas-piping to fit. Some of these had to pass beneath and through floors, and others had to be fastened to the walls.

So it was still the same story of one man's work having to be done at a time when it would not hinder other men's tasks and being finished in time for the next worker. Thus the electrician came and laid the metal tubes or conduits through which he would later pass the wiring for electric fires and lights. The carpenter worked with him, cutting notches in the joists and fixing framework between them to carry ceiling lights. For the plumber he fixed supports to carry cisterns and tanks, and fastened boards to the walls to carry water pipes to bathroom, lavatory and scullery. As these jobs often called for holes through the brickwork, it was better to do them now before the plasterers began covering the walls.

The biggest carpentry jobs were the laying of floors and the fixing of the stairs. Floor laying is a straightforward task and can be carried out rapidly if proper preparations have been made. The two most important points are a smooth level surface, without holes or cracks to collect dirt, and close joints to keep out draughts. If the joists are properly levelled, all pipes and wiring kept below floor level, and straight boards firmly nailed down, there should be no difficulty in getting a good surface.

To make sure of close joints, boards with tongues and grooves are forced close together by a *cramp* before nailing. The first board is nailed in position close against the wall opposite to the fire-place with its grooved edge away

from the wall. Three or four boards are then fitted and pressed tight with the cramps. While thus held they are nailed firmly to the joists. The cramps are then removed, more planks laid down, pressed close and nailed firmly, and so on until the whole space is covered.

Even when they are cut with care, boards seldom give a close fit to the brickwork at the ends, so skirting-boards are fitted later to give a good close finish round the walls and to avoid bringing the plastering to floor level, where it would soon be damaged when floors are swept or scrubbed. The skirting is nailed to wooden plugs driven firmly into joints in the brickwork. Short lengths of floor-board are left loose wherever necessary so that one can get at the wiring or the pipes below the floor.

The making and fitting of the staircase is a more skilled job, especially if parts of it are curved or if the stairs do not run straight from one floor to the next. Most of the making of the stairs will have been done in the carpenter's shop. They must now be fitted in position, and secured and supported there. One side is usually in contact with a wall. It is held by nailing through to wooden plugs driven firmly into the brickwork. The upper end is supported on one of the joists. The hand-rail is fitted between newel-posts at top and bottom.

To make the stairs safe, the space between hand-rail and stair is filled in with panelling or barred with banisters fixed close together. The strength of the whole staircase can be increased, and a useful cupboard formed, by enclosing the area beneath the stairs either with woodwork or with brick walling.

Built-in fittings such as window-seats, cupboards and shelves may also have to be fixed at this time. They may need to be nailed to wooden plugs fixed in the walls. If they are large and heavy, some of their framing may even need to be built into the brickwork. It is better that they should be fitted now when there is no danger of damaging the plasterwork. Besides, it helps the plasterer to make a good joint which will keep out dust.

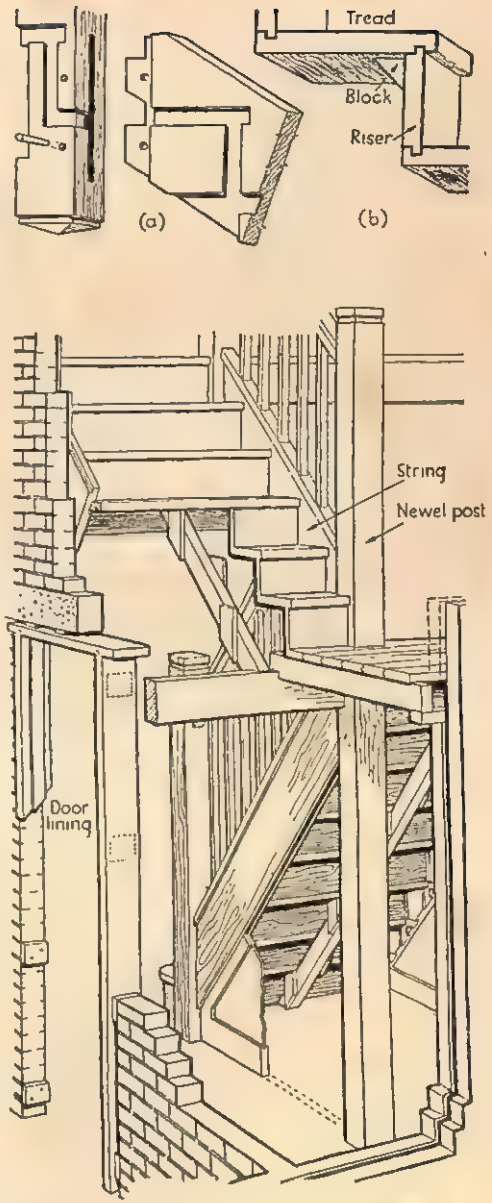


Fig. 68. Staircase construction. The cut-away drawing shows lower and upper flights with a landing between. Why are the stairs constructed in the carpenter's shop and not on the site?

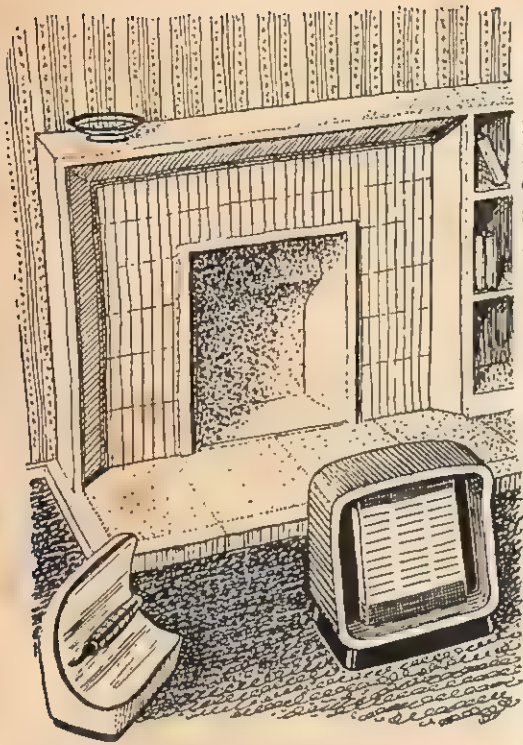


Fig. 69. Heating by radiation. Fires throw heat out into the room. Though the electric fire and gas fire shown in this drawing are portable, other types can be built in.

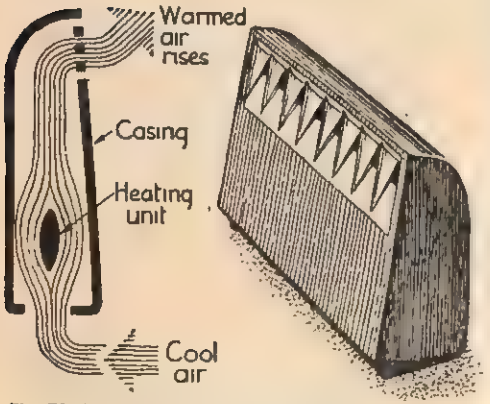


Fig. 70. Heating by convection. Convectors warm the air and so cause it to rise.

KEEPING THE HOUSE WARM

NOW that it was possible to walk round inside the building without balancing on narrow joists or climbing up some awkward ladders, Jim's mother began to come more often to the new house. She seemed concerned about the warming of the house and asked the architect what he proposed to do about it. Mr. Hodgson summed it all up something like this:

"Well, Mrs. Whitehouse, I gather that you would like three things—plenty of hot water for baths and washing up, a cosy fire to sit round on winter evenings, and a house that is comfortably warm everywhere in the winter. You want them without too much work and dirt. When your old house was built, people tried to get all those with one coal fire, and to use it for cooking too, so they put a big range in the kitchen. They hadn't made much progress from the Ancient Briton's wood fire in the middle of the floor, had they?

"Let me show you how I have arranged things here. We'll begin in the kitchen. You told me before that you did not want a big cooking-range with all the trouble and dust of a coal fire. I am having a small boiler fixed here. It will be heated by means of a closed grate burning coke or coal. That will give you all the hot water you want for the bathroom and the kitchen sink, and will warm your kitchen at the same time. I expect you like to see a bit of fire on winter days too. Well, you can have that by opening the front when you are busy in here. Under the window there are the gas-pipes all ready for your cooker and you can see the hole left in the wall for an outlet so that most of the cooking smells will escape out of doors.

"In most of the other rooms I have arranged for a brick or tiled fire-place so that you can have coal fires when you want them. I have asked the electrician to fit a plug by each hearth to allow you to use an electric fire, if you prefer it. He will also put a heater in the water-tank so that you can have hot water without burning

the boiler fire. That will leave your kitchen cooler in the summer months.

"Those will give you two of the things you asked for. Now what about the third? We've really done a good deal already to give it you, though you may not have noticed it. To have a comfortably warm house in winter we must keep out the outdoor cold and keep in the warmth we have created indoors. As Jim could tell you, we began doing that as soon as we started building the walls. The cavity or air space in the double brick wall is there for that very purpose. The carpenter has helped by making well-fitting doors and windows. The roofed porch at the side door and the entrance lobby at the front will help to keep out strong winds and snow. Your living-rooms are on the warm side of the house too, and the big windows facing south will give you lots of sun.

"Halls and staircases are liable to be cold, so I am having a new kind of warming gadget, called a convector, at the foot of the stairs. With it you should have warmed air instead of cold draughts rising to the upper landing.

"I think you will find you have quite a snug winter home, Mrs. Whitehouse, without too much labour. You can select your own styles of cooker and electric fires later, but the tiled fire-places you had better choose at once. We should like to have those fixed before the plasterers get to work."

As they went from room to room Mr. Hodgson showed her other less noticeable ways in which care had been taken to make sure of warm rooms in the winter and to keep out cold draughts. Thus the windows were metal framed. Unlike wooden frames these would not swell in damp weather so that they could not be opened, nor shrink in dry weather and let in draughts. There were no long passages leading from outer doors so that you were chilled whenever you passed from one room to another. The small corner fire in the dining space, though it did not give much room for the family to sit round it, would give more warmth to the whole room than if it had been placed in the middle of a wall.

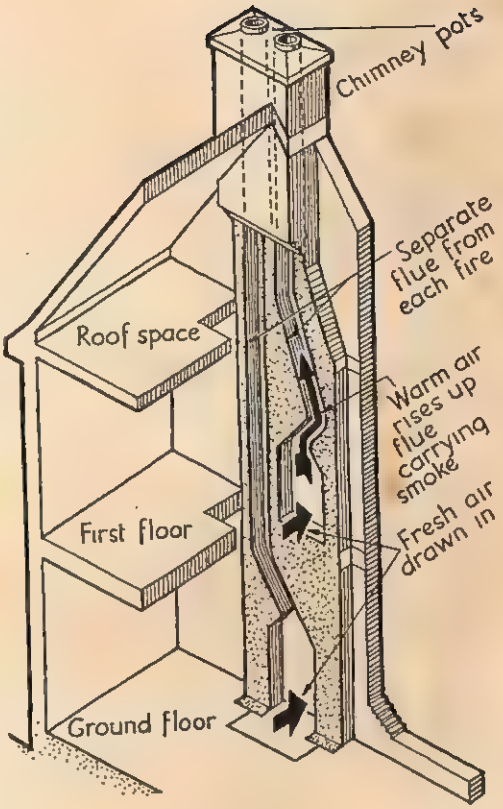


Fig. 71. How the chimney works. The chimney is the main ventilator in the house.

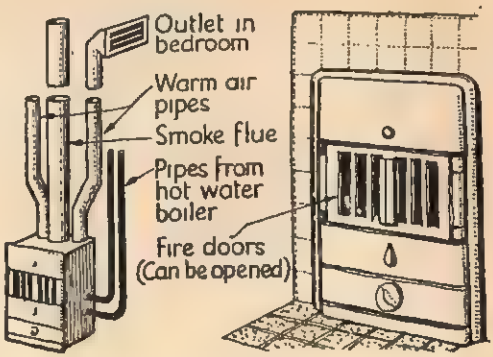


Fig. 72. One fire made to do several jobs.

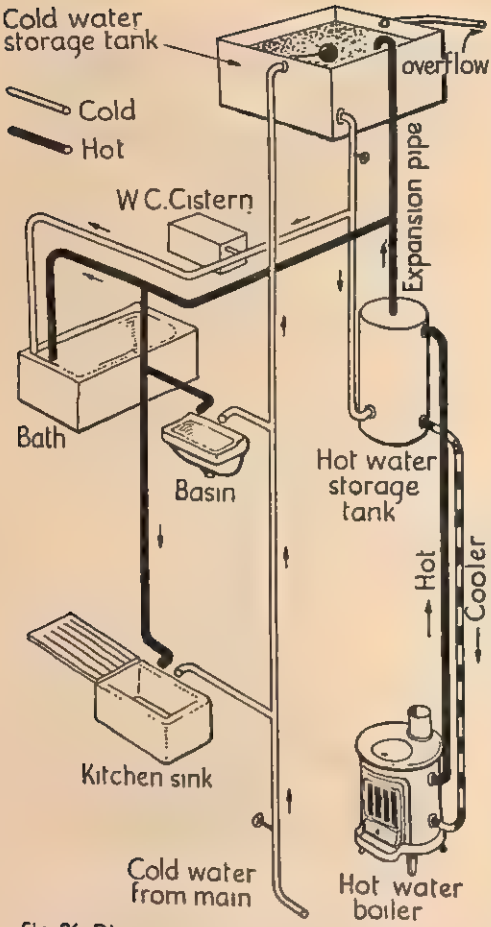


Fig. 86. Diagram of water-supply system.

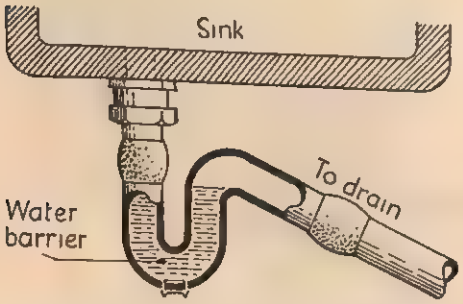


Fig. 87. Water-trap on kitchen sink. The screw-plug can be removed for cleaning.

HOT WATER

"COME for your plumbing lesson?" asked the plumber when Jim hurried into the new house soon after midday. "Well, sit down and cool off a bit till we've finished eating, and see if you can make anything out of the drawing I made for you on this bit of plank." The drawing was something like the diagram on this page. Once he had got it right way up, Jim soon found the storage and hot-water tanks and the boiler and the pipes connecting them, but how and why the water moved about in them was still a mystery when the foreman started his explanation.

"We'll begin with the boiler here behind the fire-place. Like all the pipes and cisterns, it is always kept quite full of water. When the fire is lighted and the boiler heats up, two things happen. The heated water expands, grows bigger, that is, and so it also becomes lighter. Then the heavier cold water in the cistern above pushes the lighter heated water away up this pipe here into the hot tank in the airing cupboard That's what we call the circulation —the hot water from the boiler rising into the tank and the cooler water moving down to the boiler. How long will that go on? Just as long as the tank water is cooler than the water in the boiler.

"Now, if you're going to have a bath or your mother wants to wash the dinner dishes, you turn on one of the hot taps, and out comes the water—cold at first because that water has been standing in the pipe between the tap and the cistern, but soon the water from the cistern reaches the tap, and that will be hot. You can see in the drawing how it gets to the taps. But something else happens then. As soon as hot water is drawn out of the cistern, cold water runs in from the storage tank in the roof. That will make its way down to the boiler and drive up the hotter water to the cistern, so you see, whenever you like, you can have as much hot water as the boiler and the cistern hold. We're just going to light a fire here to try out the

whole job, and I've got something for you to do too. Here are four labels I've written for you, one for each pipe on the hot cistern in the airing cupboard—cold from storage tank, cool to boiler, hot from boiler and hot to taps. I want you to tie each on its proper pipe. That will be a kind of examination for you to see if you've learned your lesson. When the fire has been going a while, you'll be able to tell how many answers you have got right."

During the afternoon the plumbers busied themselves in fixing and joining up the sink and bath outlets to the pipes already fitted by the builders, and Jim did another tracking job to see how the waste water was carried away to the drains that led underground from the house to the main sewer in the road. The queer bends in the lead pipes under the sink and wash-bowl puzzled him until the foreman explained that the water trapped in them prevented foul air and unpleasant smells from the drains entering the house. When he examined the water-closet pedestal, which had not yet been fitted, he found that the same sort of trap had been made.

The plumbers took just as much care with all the outlet pipes as with the water pipes to see that all joints were both watertight and air-tight. The builders had carefully cemented all the joints in the earthenware drain pipes. They were not allowed to cover in the drains until an official from the Health Department of the Town Council had tested them.

When the kitchen boiler had heated up for a while and set the water circulating Jim found that he had passed his examination as the foreman called it—the labels were tied on the right pipes. He had been puzzled for a while by finding what looked like the end of an extra pipe near the bottom of the cistern. Instead of being continued by a pipe leading to the boiler or the cistern however, it was connected to the electric wiring. He was told that this was the end of an *Immersion heater*, a metal tube containing a coil which could be heated electrically. It would give Mrs. Whitehouse hot water when she did not need the kitchen fire.

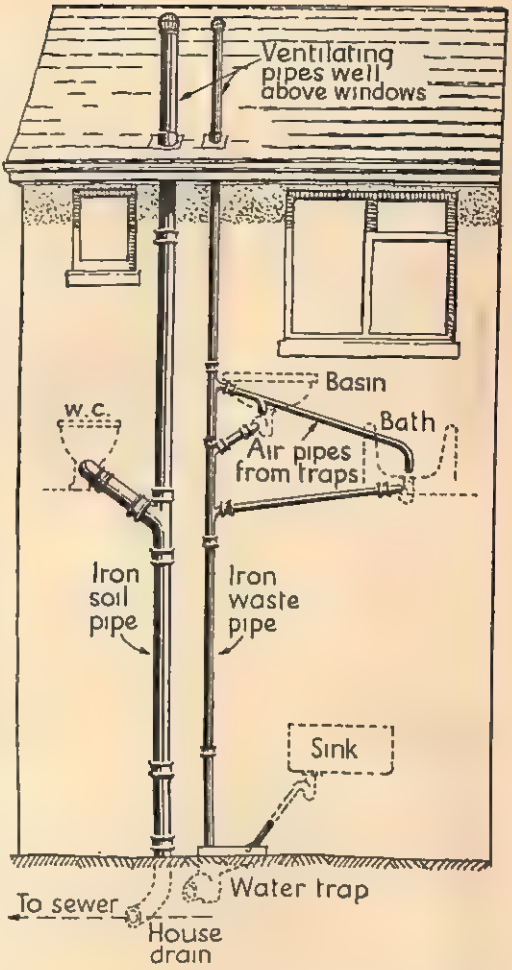


Fig. 88. How waste water passes to the drain. The ventilating pipes allow foul air and gases from the drains to escape into the air.

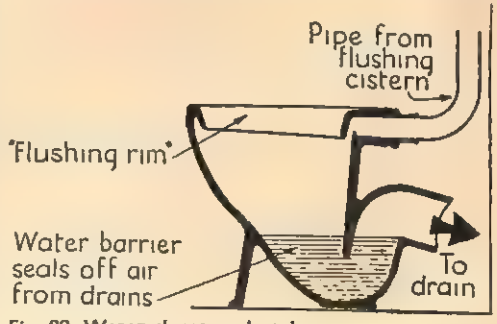


Fig. 89. Water-closet pedestal.

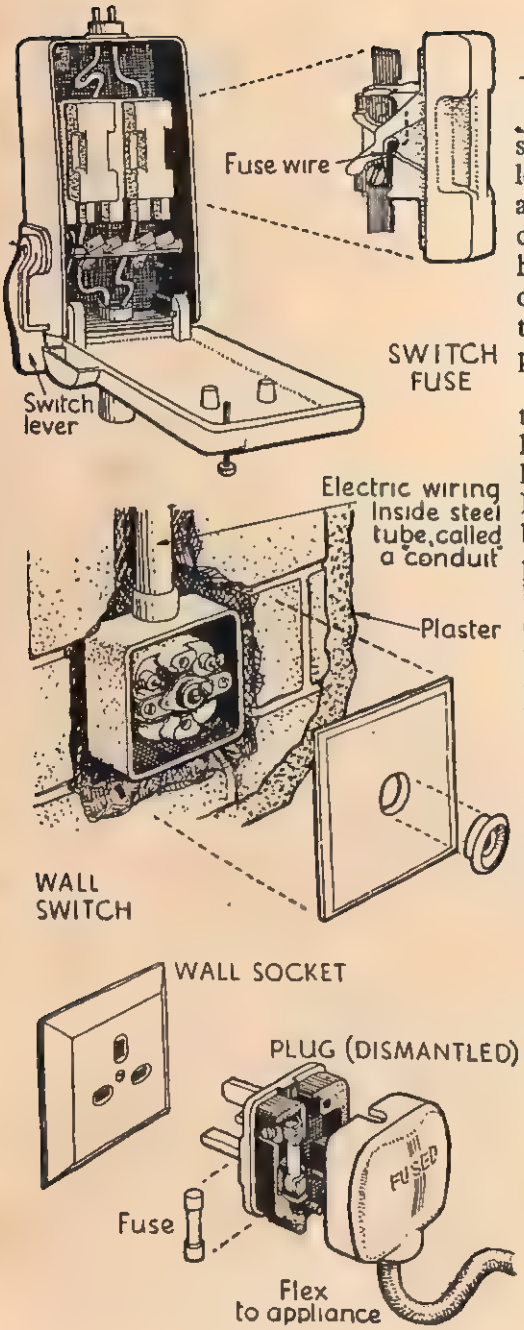


Fig. 73. Switches and fuses.

LIGHT FOR THE HOUSE

JIM rather fancied himself as an electrician. He had helped the science master to fit the stage lighting for their last school play and had learned a little about switches and how to fit a new fuse. He had even offered to fit electric door-bells for his mother as soon as the new house was finished. When he knew the wiring of the house was being done he was very glad to lend a hand so that he might see how the professional electrician did the work.

His first job was to pass the double wire through the metal tubes or conduits already laid under the floors to all the points where lights or plugs or switches were to be fitted. He was surprised to find that channels had been cut in the bricks wherever cables had to pass along walls. He had expected they would be run over the plaster and covered by wooden casing. When Jim asked about this he was told that casing was cheap work. It spoiled the look of the walls and if it was damaged at any time the casing might catch fire. Someone might even drive a nail into it to hang a picture!

After a time he set out to trace the way in which the electric current from the cable in the street would pass to the lights and plugs in the house. He had promised to report to his class about this in their next science lesson. Here are the notes he made:

"A heavy service cable runs from the main cable, underground, where it is not likely to be damaged in digging the garden. Enters house through hole in outside wall to hall cupboard. There it passes into metal fuse-box, closed and sealed. Two thick cables pass to meter. Both meter and fuse-box are marked PROPERTY OF ELECTRICITY BOARD. All fitting so far done by workmen of Board. Our electrician fitted another fuse-box from which wiring goes to all rooms. Electricity Board will connect this to meter when they have inspected and passed house wiring. Wiring to light switches and to power points are kept separate and have different fuses. Jointing of wires is avoided as far

as possible and only done at points which can be opened up easily for inspection. Two wires go to each lamp or power unit. The switch is put in the live wire, not in the return wire."

With these notes and some sketches he made on the blackboard, Jim got through his report quite well. Of course, there were lots of questions when he had finished his talk. He had to explain about *fuses* and how they worked. Some of the class tried to trip him up with questions about *volts* and *amperes*. The science teacher had to help him out there.

There were so many questions about lamps that these had to be left till the next lesson period. Some of the boys thought there were far too many lights in Jim's house, so he had to explain why they had them all. He said they needed light for two different purposes. General lighting was needed during meals or when the family was sitting round the fire talking. This did not need to be very bright. In fact, it was pleasanter if it was rather dim and soft. Ceiling fittings gave this kind of light. It was a waste of current to put lamps in these that gave a powerful enough light for reading or sewing. For work of that kind a small-powered lamp close at hand was much better and used less current.

In the living-room they were going to have two extra small lamps. One near the fire gave light for reading or for his mother's sewing and darning. Another portable lamp could be placed on the table for Jim to do his homework or Dad to write letters. One central light hung from the ceiling was enough in the dining space. In this way they could have much better and pleasanter lighting than in their old house, and yet use less electricity.

Some of the boys asked questions about electric fires and, though Jim had only undertaken to talk about the lighting, he did his best to answer them. He showed how convenient it was on cool spring mornings or evenings to have a fire that lighted at once and could be put out when it was no longer needed.

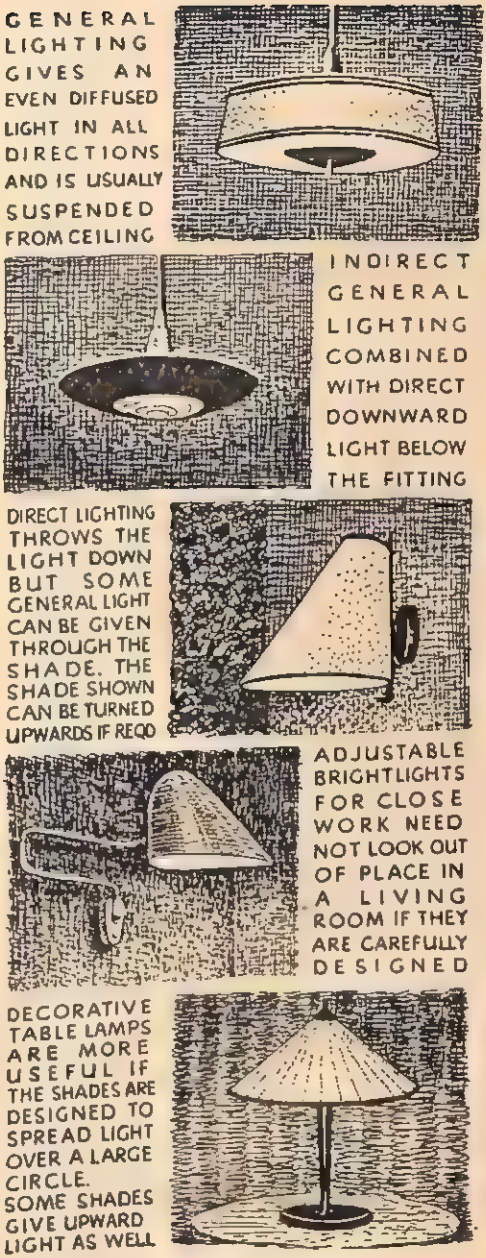


Fig. 74. Different types of electric light fittings.

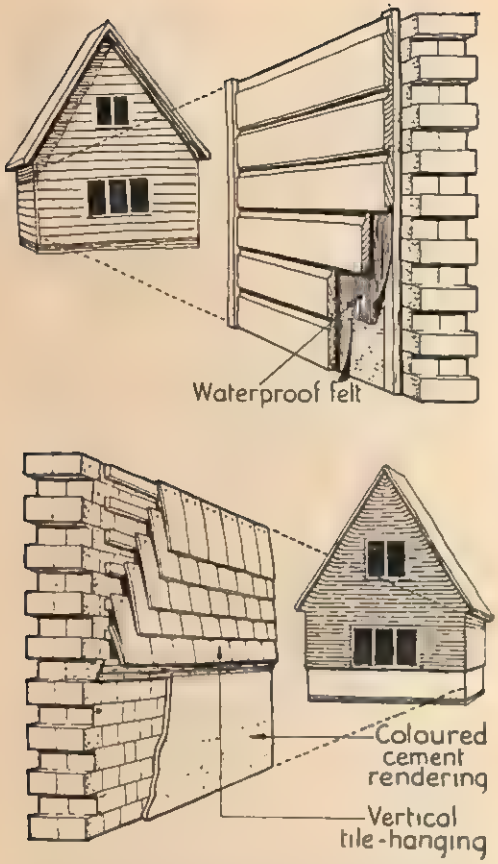


Fig. 75. Three ways of covering outside walls. A brick wall of only 9-inch thickness should have some external covering.

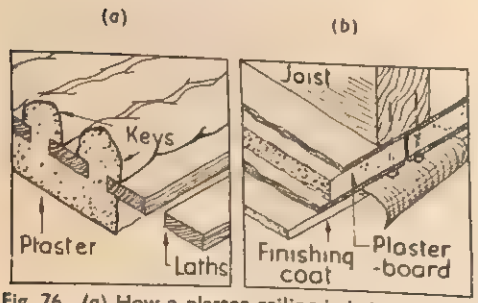


Fig. 76. (*a*) How a plaster ceiling is held in place. (*b*) A plasterboard ceiling.

COVERING THE WALLS

WHEN the plumbers and electricians had finished their jobs, the inside walls of the house looked a sad sight. The bricklayers had been careful to smooth off the mortar joints between the bricks on the outsides of the walls, but they seemed to have been very careless with the inside walls. Mr. Stone noticed Jim looking rather disgustedly at these walls one day, and asked him what was wrong. He laughed when Jim said it did not seem to him that the bricklayers had done a very good job after all.

"And tomorrow, when the plasterers arrive, you'll be wanting to know why the plaster sticks to the walls! They'd be annoyed if we left the brick joints nicely smoothed off. All those rough patches and open joints are to give the plaster a grip; they are what hold it fast to the wall. When you climb a wall or a tree you look for cracks and holes to give you a hand-hold or a toe-hold. The open brick joints do the same for the wall plaster. You will see it best if you come up when they are doing a ceiling. They cover the ceiling with thin laths nailed to the joists, but half an inch apart. When the plaster is applied firmly some of it is forced between the laths and spreads over the top side out of sight. As the plaster dries, it hangs there as if it were held by hundreds of hooks, just as you would hang by crooking your fingers round the laths. That's what we call *keying* the plaster.

"We shall put three coats of plaster on the walls and two on the ceiling. The first coats level up the surface, and the second and third give a smooth hard finish. Each coat except the last has shallow grooves scratched in it before it sets so as to form keying for the next coat. I can see you have a lot of questions you want to ask me about plasterwork, but I think you had better save them up for the plasterer's labourer tomorrow. Mind you don't bother the plasterer with them, though—once he starts on a room he doesn't stop till it is done, so you had better keep out of his way."

Not all the walls were finished with plaster, however. In the kitchen and bathroom a covering of glazed tiles was put over the first coat of plaster. This, too, was a hurried job. The rough first coat was covered with a thin layer of plaster of Paris. This dries and sets hard so quickly that the tiles, already soaking in water, must be applied at once. One man mixed and spread the plaster whilst another fitted the tiles.

Jim managed to have a talk with the plasterer during his dinner-time break. He told Jim that plastering is a dying trade. Room walls can be covered in other ways that cost more at first but save decorating costs later. When wood can be got, there are various styles of panelling that could be used. Sheets of glass or of coloured plastic materials are sometimes used, being fastened to light wood framing fixed over the bricks. Ceilings are now often covered with factory-made sheets of plasterboard. These are nailed to the joists and then coated with just one thin layer of plaster to hide the joints and nails.

Jim's father had suggested to the architect that the outside walls of the house should be covered with *rough-cast*. This is done by applying two coats of cement plaster and scattering fine broken stone on the second coat before it is dry. He thought it would help to keep the walls dry.

Mr. Hodgson, however, had said that this was unnecessary with cavity walls, and they agreed to have a thin coat of white cement applied like whitewash instead.

The central portion of the house front which contained all the windows on that side had been built as a nine-inch wall without a cavity. It was covered with weatherboards which looked well alongside the light colour of the cement-washed bricks. So here again the plasterers had lost a job. It would have been their work to apply the rough-cast finish. Jim decided that if he entered the building trade it would not be as a plasterer.

Some modern ways of covering inside walls.

Fig. 77. Veneered wood panelling.

Fig. 78. Boarded panels; plaster round window

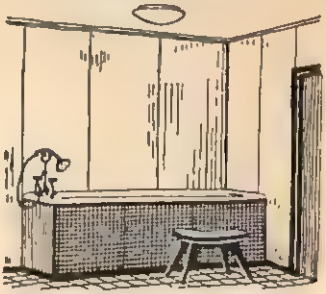


Fig. 79. Coloured glass and plastic sheets.

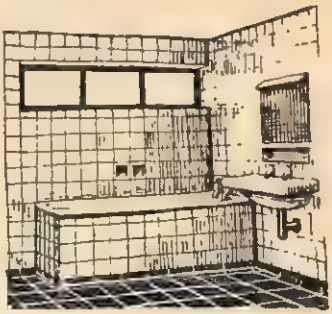


Fig. 80. Coloured tiles on walls and floor.

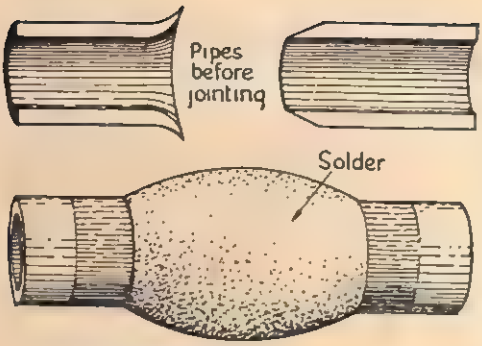
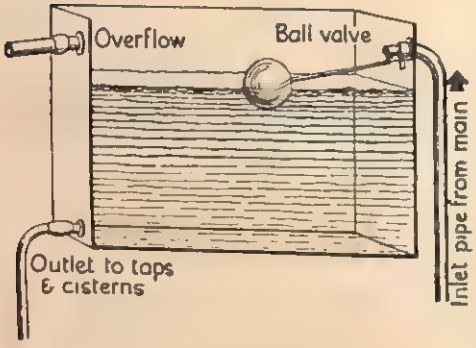


Fig. 81. A soldered joint in a lead water-pipe. Copper pipes with screwed joints are now often used.



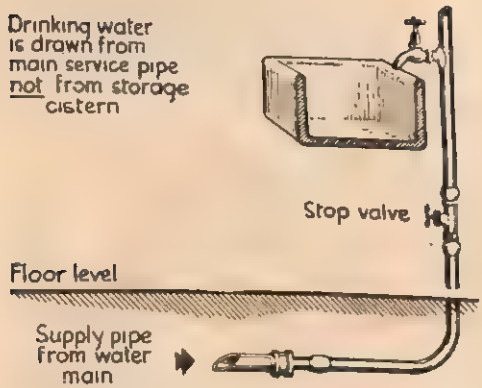


Fig. 82. How cold water is supplied. Drinking-water is always drawn direct from the service pipe.

WHEN Jim next visited the house he found that the plumbers were at work. They had been almost the first workmen on the job for they had laid a pipe from the main and fixed a tap whilst the foundation trenches were being cut. That had to be done so that the builders had water at hand to mix their concrete and mortar. Now they were fitting the pipes needed to carry water to all the places in the house where it would be needed.

When Jim started to track the water supply he found it was carried by a pipe from the water-main in the road through a hole in the kitchen wall. The plumber explained that this pipe was buried two feet deep so that it would be safe from frost. Where it came above ground level the pipe was wrapped with sacking and shut up in a wooden case for the same reason. When water freezes, it expands, and so is likely to burst the pipe. As the work went on, Jim found that all the pipes and cisterns were protected in this way.

In some ways water supply and electricity supply were similar. There was no water meter, but there was a stopcock just inside the kitchen wall which could cut off the whole supply just like the main electric switch by the fuse-box.

When he followed the service pipe through the house, he found it went from the kitchen sink to the wash-bowl in the bathroom and then up to a storage tank just under the roof. When he climbed up there he found the plumber had just finished making the connections to the tank and was fixing a sort of blanket round it. The workman explained that most of the water used in the house would be drawn from this tank. It was therefore placed high up in the house just as the town reservoir was made high in the hills well above the level of the town. The cold-water taps over the kitchen sink and the bathroom bowl were fitted direct to the service pipe so that drinking-water would be got fresh from the main and not from the tank.

Jim watched one of the men fitting these taps and so found part of the answer to one question he had been waiting to ask—why were lead pipes used? He saw how easily a hole was cut in the main pipe and opened out until another could be fitted into it and the joint soldered over and made watertight. He saw, too, how readily this kind of pipe can be formed into smooth bends round awkward corners without making joints.

The workman also took a tap to pieces for him so that he could see where the leather washer was fitted, and how it was forced down to close the inlet when the water was turned off. At lunch-time he discovered for himself how the valves worked in the storage and water-closet cisterns. One of these was lying on the kitchen floor so he could easily see how water rising in the cistern lifted the copper ball and so pressed a rubber washer over the open end of the inlet pipe. When water was drawn from the cistern the ball sank and opened the inlet. Now he felt he would be able to tackle the job himself when his mother complained about the kitchen taps dripping or the lavatory cistern overflowing.

Later he saw the pipes for the hot-water system being fitted. They connected the storage cistern in the roof to the hot-water tank in the airing cupboard, and the tank to the boiler in the kitchen and the hot-water taps in the bathroom and over the kitchen sink. This all seemed rather complicated so Jim got the foreman to promise to explain it all during lunch-time the next day.

Jim had noticed that some of the pipes carrying hot water to the wash-basins at school were of copper and he got in a final question about those before he left. He was told that they were stronger than lead pipes and so did not sag and bend when long straight sections were laid horizontally. Lead had become much dearer in recent years too. Its great advantage was that it could be easily bent to fit awkward corners, whereas copper pipes would have to be cut and jointed at every bend.

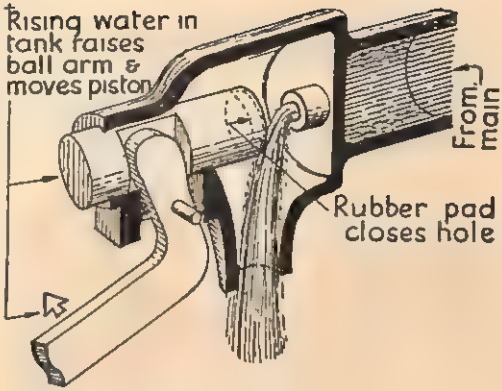


Fig. 83. How a ball-valve works.

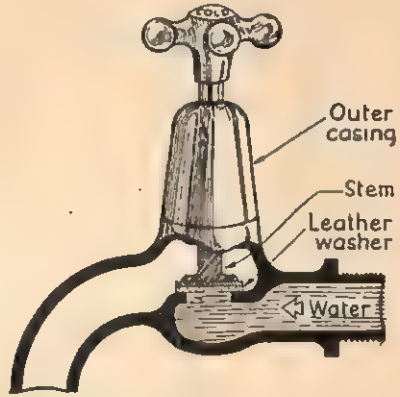


Fig. 84. How a tap works.

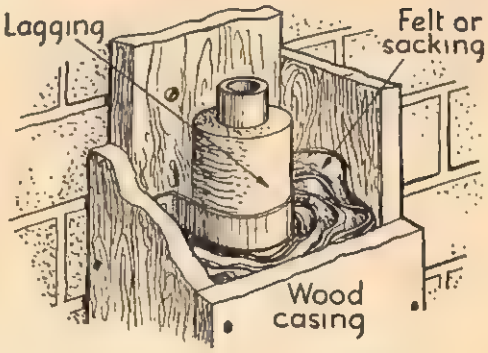


Fig. 85. Protecting a water-pipe against frost.

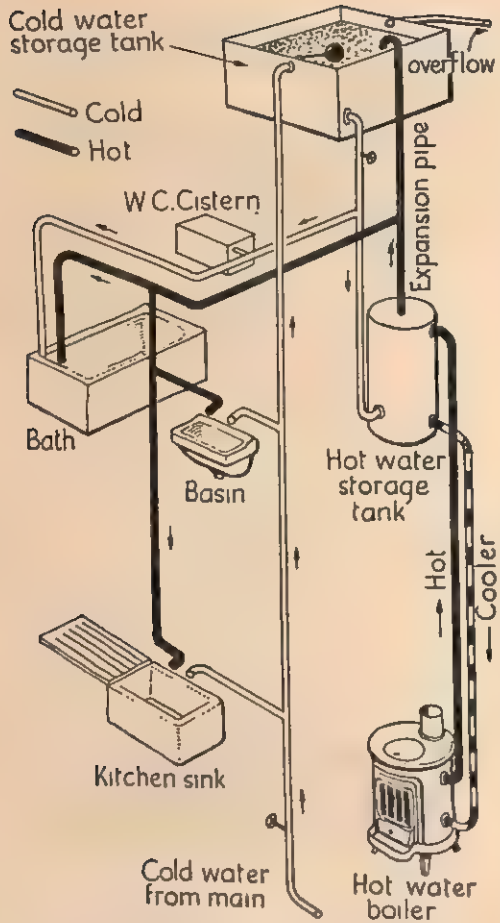


Fig. 86. Diagram of water-supply system.

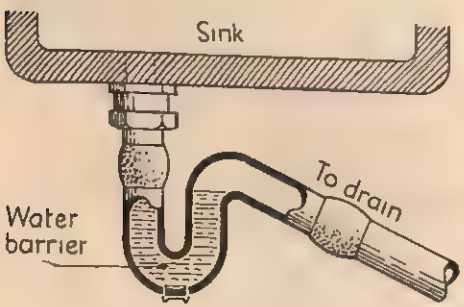


Fig. 87. Water-trap on kitchen sink. The screw-plug can be removed for cleaning.

HOT WATER

"COME for your plumbing lesson?" asked the plumber when Jim hurried into the new house soon after midday. "Well, sit down and cool off a bit till we've finished eating, and see if you can make anything out of the drawing I made for you on this bit of plank." The drawing was something like the diagram on this page. Once he had got it right way up, Jim soon found the storage and hot-water tanks and the boiler and the pipes connecting them, but how and why the water moved about in them was still a mystery when the foreman started his explanation.

"We'll begin with the boiler here behind the fire-place. Like all the pipes and cisterns, it is always kept quite full of water. When the fire is lighted and the boiler heats up, two things happen. The heated water expands, grows bigger, that is, and so it also becomes lighter. Then the heavier cold water in the cistern above pushes the lighter heated water away up this pipe here into the hot tank in the airing cupboard That's what we call the circulation —the hot water from the boiler rising into the tank and the cooler water moving down to the boiler. How long will that go on? Just as long as the tank water is cooler than the water in the boiler.

"Now, if you're going to have a bath or your mother wants to wash the dinner dishes, you turn on one of the hot taps, and out comes the water—cold at first because that water has been standing in the pipe between the tap and the cistern, but soon the water from the cistern reaches the tap, and that will be hot. You can see in the drawing how it gets to the taps. But something else happens then. As soon as hot water is drawn out of the cistern, cold water runs in from the storage tank in the roof. That will make its way down to the boiler and drive up the hotter water to the cistern, so you see, whenever you like, you can have as much hot water as the boiler and the cistern hold. We're just going to light a fire here to try out the

whole job, and I've got something for you to do too. Here are four labels I've written for you, one for each pipe on the hot cistern in the airing cupboard—cold from storage tank, cool to boiler, hot from boiler and hot to taps. I want you to tie each on its proper pipe. That will be a kind of examination for you to see if you've learned your lesson. When the fire has been going a while, you'll be able to tell how many answers you have got right."

During the afternoon the plumbers busied themselves in fixing and joining up the sink and bath outlets to the pipes already fitted by the builders, and Jim did another tracking job to see how the waste water was carried away to the drains that led underground from the house to the main sewer in the road. The queer bends in the lead pipes under the sink and wash-bowl puzzled him until the foreman explained that the water trapped in them prevented foul air and unpleasant smells from the drains entering the house. When he examined the water-closet pedestal, which had not yet been fitted, he found that the same sort of trap had been made.

The plumbers took just as much care with all the outlet pipes as with the water pipes to see that all joints were both watertight and air-tight. The builders had carefully cemented all the joints in the earthenware drain pipes. They were not allowed to cover in the drains until an official from the Health Department of the Town Council had tested them.

When the kitchen boiler had heated up for a while and set the water circulating Jim found that he had passed his examination as the foreman called it—the labels were tied on the right pipes. He had been puzzled for a while by finding what looked like the end of an extra pipe near the bottom of the cistern. Instead of being continued by a pipe leading to the boiler or the cistern however, it was connected to the electric wiring. He was told that this was the end of an *Immersion heater*, a metal tube containing a coil which could be heated electrically. It would give Mrs. Whitehouse hot water when she did not need the kitchen fire.

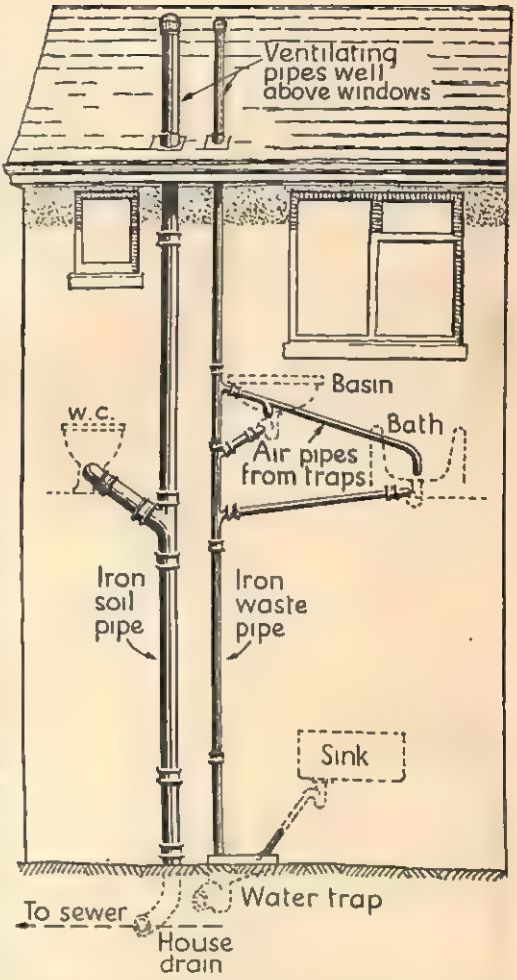


Fig. 88. How waste water passes to the drain. The ventilating pipes allow foul air and gases from the drains to escape into the air.

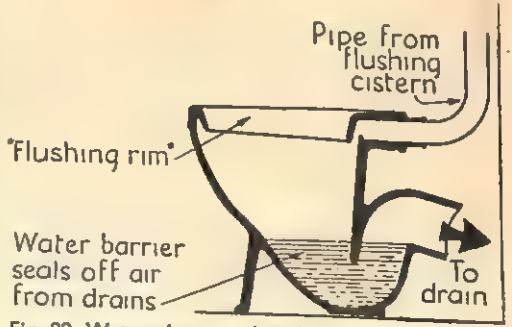


Fig. 89. Water-closet pedestal.

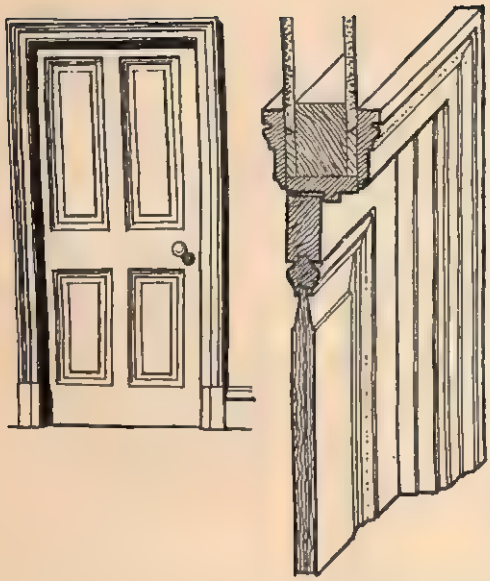


Fig. 90. Old style panelled door and mouldings.

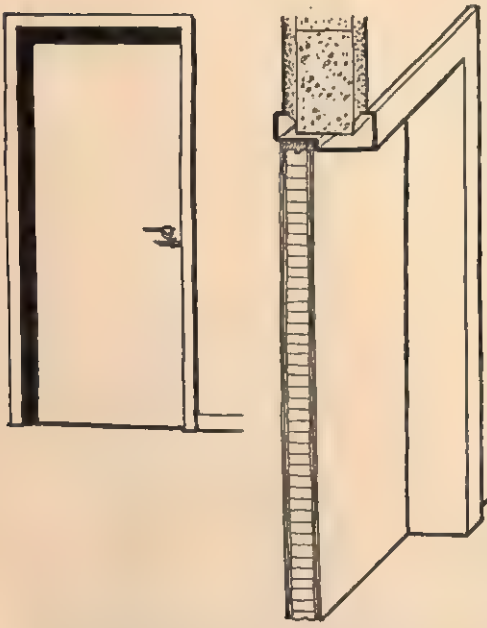


Fig. 91. Flush door and pressed-steel frame.

THE CARPENTER FINISHES OFF

THE house was getting nearer completion every day and had now reached the stage when the carpenter was fixing doors, shelves and cupboards, and all those odd fittings that make a house good to live in. Jim's mother was getting quite excited again about her new home and spent quite a lot of time there. She had been determined from the first that they should have everything they could afford that would make the house comfortable or help to keep it clean and tidy without waste of her time or strength. She had much to say when the kitchen was planned and had visited the showrooms of the builders' merchants to see what they had to tell her. She would have nothing to do with an earthenware kitchen sink once she had seen a stainless-steel unit fitted with draining-board, cupboards and rubbish bin.

She had had a long discussion with the architect and the builder about kitchen cupboards. Mr. Stone had objected that she wanted so many they would fill up her kitchen floor until she had no room to move. "You'll have to shut the cupboard door before you can put the sugar-basin on the table!" he said. "Put the cupboards high up on the walls then, and fit them with sliding doors," replied Mrs. Whitehouse. "I must have somewhere to store my jam and bottled fruit. And you can put the crockery cupboards underneath."

She had had a wet wash-day that week and it started her on another topic. "I hate a kitchen full of wet things hanging about, and Dad likes it less than I do. Can't you do something better for me, Mr. Hodgson, than the old clothes-horse in front of the fire and rack along the ceiling?" The architect told her he had recently seen a drying cabinet that might suit her, and he could probably find a place for it if she liked the idea. It was really only a tall cupboard with a small gas or electric heater in the bottom section. When he went on to explain that it would not be big enough to hold a

big family wash he expected she would say it was no good to her then. To his surprise she exclaimed: "That's just the thing I want!" With hot water always available, she had decided to do away with big wash-days. "A little and often, Mr. Hodgson, is much better. It's showers, not floods, that make the flowers grow."

She had spent a long time looking at the kitchen plan the architect had finally produced. Now the fittings were being built into place she wanted to see if it was all as good as she had hoped. Mr. Stone was there to go over the house with her, and they went first to the kitchen, where the carpenter was at work fitting shelves and cupboard doors. She went from pantry to cupboard and from cupboard to sink and gas-stove. "It won't be a long walk for a tired woman to get a meal ready in this kitchen, Mr. Stone," she said. The high sink pleased her too. "That will save me a lot of backaches," she explained. It was nearly at table level, just the right height for her to work at it in comfort.

When they went through the other rooms and up the staircase she stopped to look at the flush doors and the plain mouldings round them and along the skirting-boards. "Plenty of light and no corners for dust to gather is my motto," she told Mr. Stone. The taps, the door-handles and window-fastenings also pleased her. "No brass, Mr. Stone. It looks nice and bright, I know, and some people like it, but they don't have to polish it and I do."

"All you want now is a refrigerator," remarked the builder as they made their way downstairs. "I did hear Jim say he was going to save up for that as soon as he started work, so we've left a place for it in the kitchen."

Back in the kitchen again he said, "I think we have done all we can to lighten your work here in preparing meals and dealing with your washing. There is a plug here so that you can use an electric iron and the carpenter is going to fix a hinged ironing-board in the tall cupboard. That should be convenient and useful."

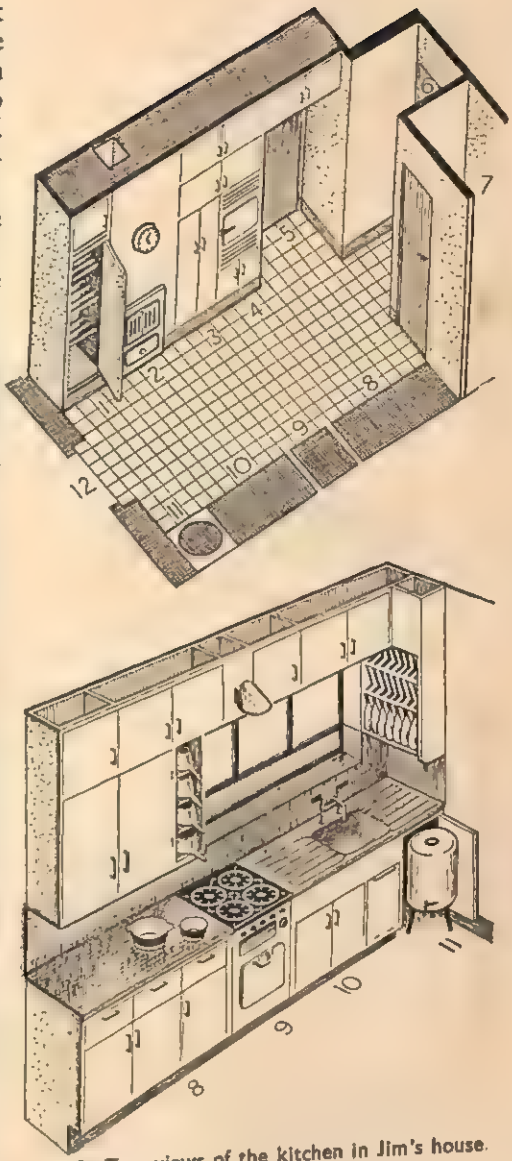


Fig. 92. Two views of the kitchen in Jim's house.

1. Drying cupboard.
2. Hot-water boiler.
3. Broom cupboard.
4. Refrigerator.
5. Door to dining space.
6. Door to hall.
7. Larder.
8. Working table—metal top.
9. Cooker.
10. Metal sink, refuse bin under.
11. Drainer with gas-boiler under.
12. Outer door.

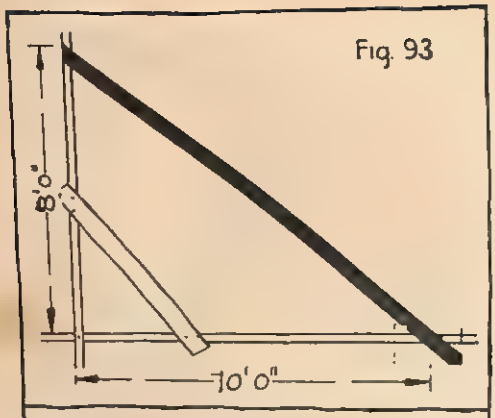
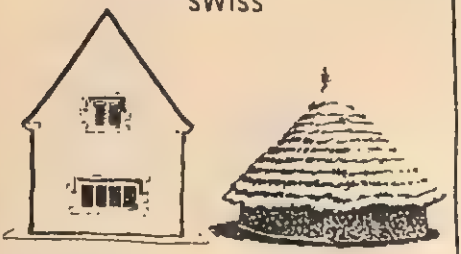


Fig. 93

SWISS



ENGLISH AFRICAN

Fig. 94

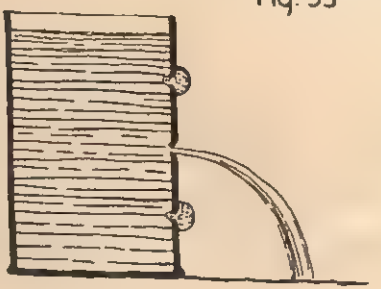


Fig. 95

1 Fig. 93 shows a rafter and two planks laid out on the ground by a carpenter, ready to mark the length and angles at which the rafter must be cut for a roof. The ridge is 8 feet above the walls and the span of the roof is 20 feet. Make a drawing or model to scale and find the length of the rafter and the angles at either end.

What is the *rise* of this roof for each foot measured horizontally?

2 In Britain roofs seldom project more than a few inches beyond the walls. In snowy mountain lands, like Norway or Switzerland, and in some hot and sunny lands such as Africa, they often reach a yard or more beyond them. Can you suggest any reasons for this difference?

3 What advantages has the house with an under-roof of boards covered with felt, compared with the house in which these are omitted?

4 The following materials are all used for house floorings: softwood deals, hardwood blocks, quarry tiles, plain concrete. What are the advantages and disadvantages of each? Which would you use for each of the following parts of a house: an open porch, a scullery, a front hall, a bathroom, a bedroom? Explain why in each case.

5 Pierce three small holes in the side of a tall tin can. Stop up each with clay or plasticine and fill the can to the top with water. If you now remove the plug from one of the holes a jet of water will pour out. Measure the distance the jet reaches from each hole in turn. (Remember to fill the can to the same level each time.)

Can you explain why the jet reaches out farther from one hole than from the others? Is the jet shown in Fig. 95 the biggest?

Why does the jet reach less far from any of the holes as the water level sinks in the can?

Now can you see why the water rushes out with greater force from the cold tap in the kitchen than from the hot tap?

6 Fig. 96 shows part of a stairway. The upper floor in this house can be reached by two different staircases. On the front stair the treads are 10 inches wide and the risers 7 inches high; on the back stair they are 9 inches and 8 inches respectively. Which is the steeper staircase? Which has more steps? If the steps are the same width, which staircase requires more wood?

7 Fig. 97 shows a hot-water cistern with its connections to the boiler already made. The pipes leading (*a*) *from* the cold-water storage tank, and (*b*) *to* the hot taps in bathroom and kitchen are still to be fitted. Which should be connected at *X* and which at *Y*? Explain why.

8 Fig. 98 shows a tank being emptied by means of a siphon tube. How does this work? Can you find an example of a siphon in any of the sketches of a domestic water system?

9 In an old-fashioned house Mother may have to walk many miles a day in preparing meals —backwards and forwards between pantry and cooker, cupboard and sink, kitchen and dining-room. Draw a plan and sketches of a kitchen to show how you could save her much of this labour by placing cupboards, stove and doors in better positions.

10 The quaint carvings in Fig. 61 are from New Zealand, China and Mexico respectively. The Indians of British Columbia raise carved totem-poles by their houses and Boy Scouts in Britain have sometimes copied them. Draw and then carve a model pole for Bear or Wolf Cubs or an Eagle patrol.

11 Examine any old brick walling in your neighbourhood and sketch the bond patterns they show. Why do modern cavity-walled houses not show the same variety of bonds?

12 It is often difficult to provide lighting and heating for farmhouses and other isolated dwellings in the country. In what ways are these difficulties overcome?

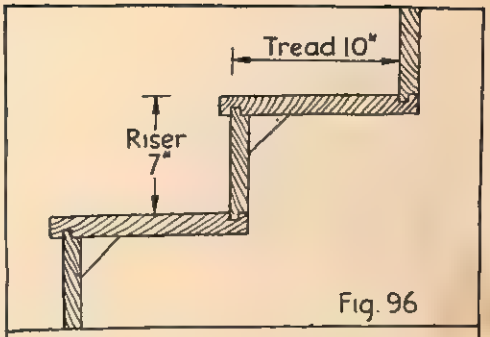


Fig. 96

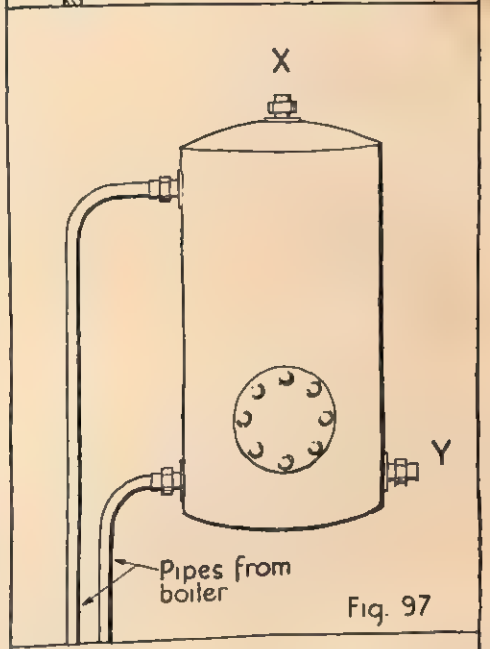


Fig. 97

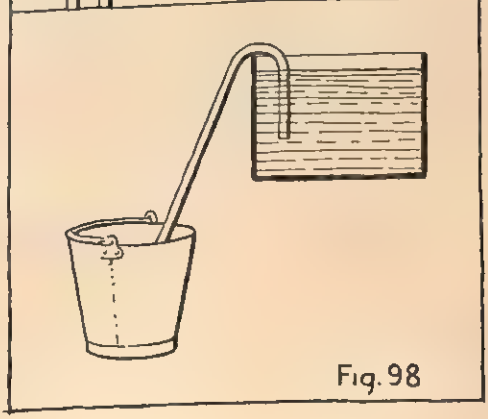


Fig. 98

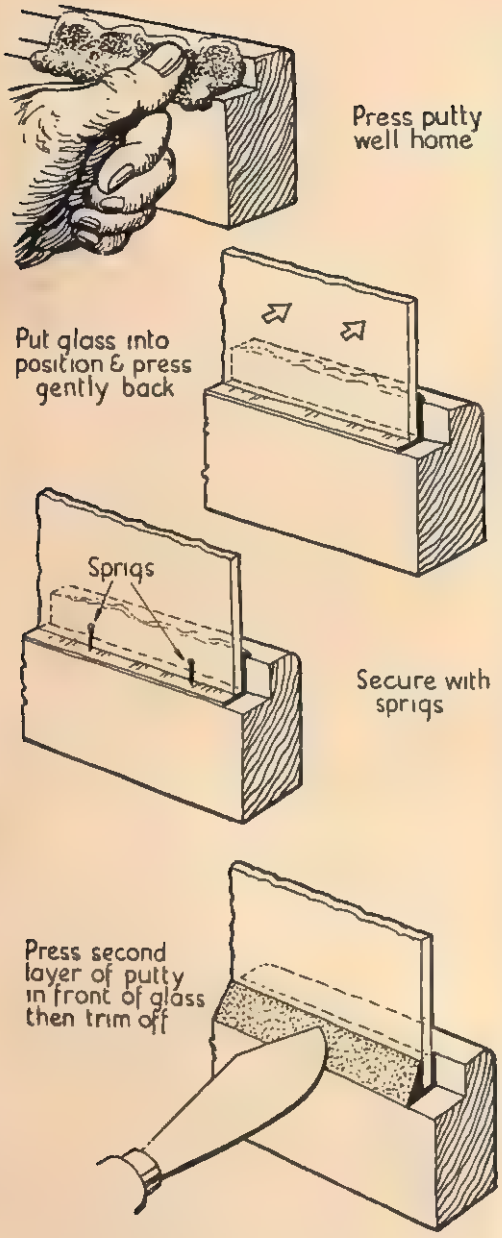


Fig. 99. Fitting a window-pane.

WHEN Mrs. Whitehouse came home from the new house one Friday afternoon and told Jim and his father that the painters had started work, they knew it would soon be time for them to move in. Painting could not be done until the other workmen had finished their dusty tasks and the rubbish and dirt had been cleared away. Jim's friend Joe had made up his mind to become a painter when he left school. Already his father had arranged for him to have a trial for a few weeks with the very man who was doing the painting for Mr. Stone. If Joe liked the work he would become an apprentice and spend five years learning the trade. Jim could not imagine what there could be to take all that time to learn, but this seemed a good opportunity to find out, so Joe and he were on the job as early as the workmen on the Saturday morning.

All the outside doors and window-frames had been given a coat of priming paint previously. The carpenter had done this before they came to the building site. Window glass had been fitted as soon as the roof was finished and the floors laid. The tool-shed had been used by the workmen as a store so the fitting of its window and door had been one of the carpenter's last tasks. They were still without glass or paint. As the weather had been dry for several days the painter was anxious that this work should be done at once, so he sent off the boys to help one of his apprentices.

Joe was soon given a brush and a bottle of varnish and told to paint over all the knots in the woodwork, and Jim was given a lump of putty to soften by squeezing and working it in his hands. The apprentice quickly painted the frame of the window with what he called a primer. He was very particular to see this got into all the joints and corners.

The lads talked about paint and painting as they worked. Thus Jim and Joe learned that the priming paint was made by stirring a paste of red lead with linseed-oil and turpentine

or spirits. This was made thinner than the later coats so that it sank quickly into the wood. The oil was quickly soaked up and made the surface of the wood waterproof, whilst the spirit helped it to dry quickly. The lead filled up the pores or tiny holes in the wood and thus helped to keep out moisture. It was also poisonous to the moulds and fungi which grow on damp wood and cause it to decay. They learned that the varnish Joe had used would set hard over the knots and prevent the resin in them from bubbling out in hot weather and would also keep them from showing through the finished paint.

As soon as the window paint was dry enough the boys had their first lesson in glazing. Jim had got the oily putty beautifully soft and smooth and they were shown how to lay the first bed ready for the glass. The apprentice pressed in the panes of glass and then drove in tiny nails or sprigs to hold them in place. The boys pressed in the second bed of putty and then tried trimming it off whilst the apprentice went on with the painting of the door. They found it was not so easy as it looked to get a nice neat finish with the putty-knife.

When the apprentice had given them a few hints and they had watched him paint the outside of the door he left them to paint the inside. He began putting ladders away and cleaning brushes ready for the week-end. They soon learned two things about painting—not to get too much paint on the brush and not to try and spread the paint too thinly. If they had too much it ran over the wood, especially in the corners and down the edges. If they used too little all the brush marks showed.

In the following week two more coats of paint were applied to the tool-shed door just as they had been to all the other woodwork. The second coat was of green paint as this was the colour in which the work was to be finished. The final coat was rather different in its composition from the first two. It gave a hard glossy surface which looked well and also protected the woodwork from damp.

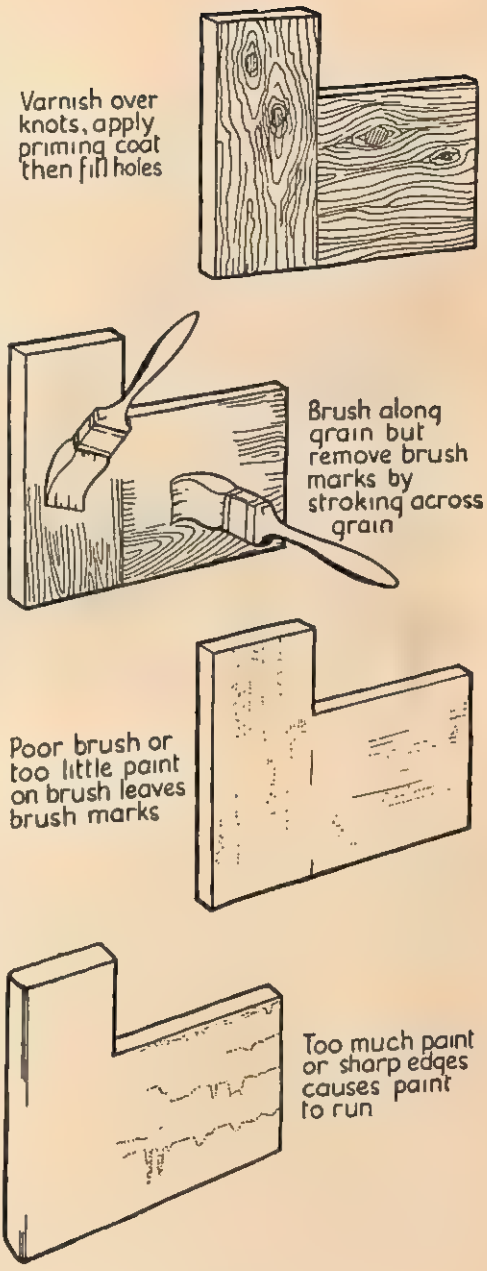


Fig. 100. Applying paint to woodwork.

Fig. 101. A sitting-room a hundred years ago. What would Mrs. Whitehouse have to say about this room? Is it (*a*) pleasing; (*b*) healthy; (*c*) easy to keep clean?

PAINTER AND DECORATOR

WHEN Jim next visited the house, the painters were nearly finished and he had the good luck to find the master painter free and ready to talk. He was looking over the outside work, and Jim went round with him. The green and cream paint looked smart in the bright sunshine. "Yes," said the painter, "it looks well and should last a few years. The woodwork was really dry when we painted it; we've used good lead paint everywhere outside, and that should keep the weather out and save the timber from decaying. That's the main thing to go for in outside painting—all the cracks and joints filled up and a nice, smooth surface everywhere, leaving nowhere for the rain to soak in. Good looks come after that. I'm a painter and decorator, but I always say I'm a painter first. Now let's look round inside. That's more of a decorator's job. Fashions in decoration change nearly as often as fashions in ladies' hats, but I don't think we'll ever go back to the decorating styles of our grandmothers' days."

As they stepped into the hall he stopped to look at the staircase and the doors. "When I was a young fellow we'd have painted all this dark-brown, and it would have looked as dark and gloomy as a prison cell. This nice shiny cream enamel will make you feel like singing when you come down in the morning. And how do you like this living-room? We've distempered all the plastered

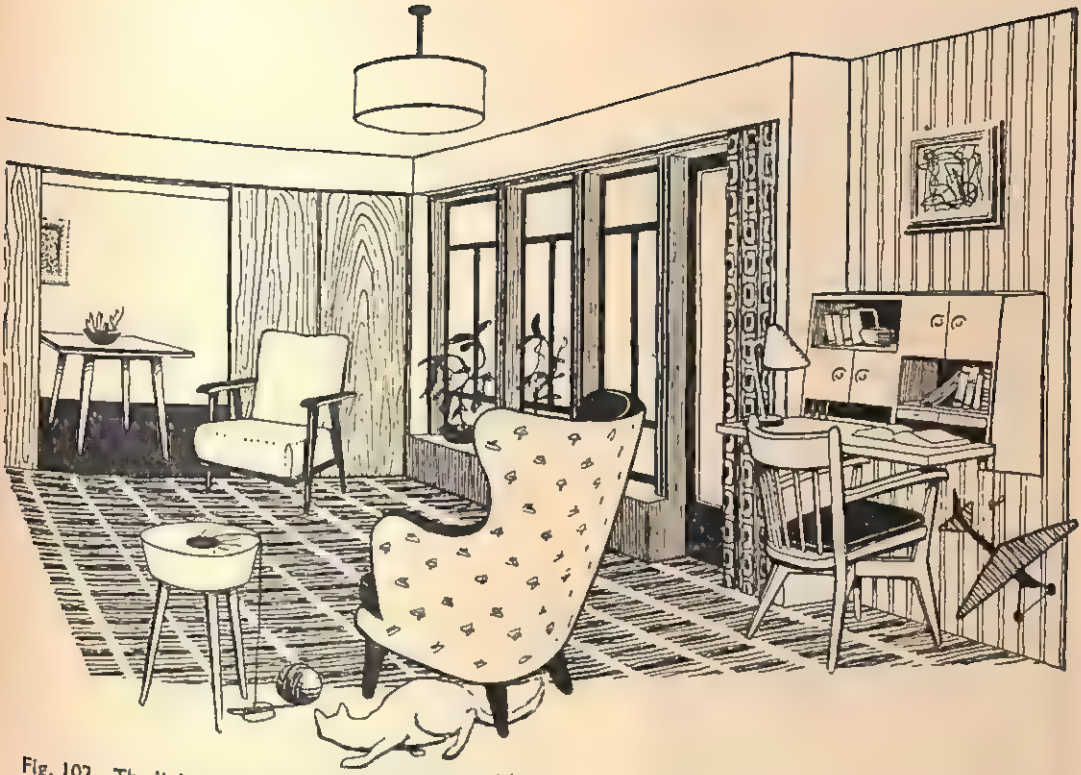


Fig. 102. The living space in Jim's house. The partition in the far wall has been opened a little to show the dining space beyond. Find from Fig. 40 where the fire-place is.

walls in the house in light colours, but changed the colour a bit so that no two are quite the same. This golden colour here should be warm and bright even on winter days, and the darker paint on the doors and windows shows it up well. But I expect you're more interested in what we've done to your room upstairs, so off you go, and you can tell me afterwards what you think of it."

Jim ran up the stairs to the bedroom overlooking the garden which he had persuaded his parents to let him have for his very own. When he opened the door he just stood and stared for a while. The afternoon sun shone through the window; his mother had scrubbed the floor, and the room was so spotless that he took off his shoes before he tiptoed in. The walls were a lovely pale blue, just like the eggs he had found in a nest in the hedge at the bottom of the garden. The woodwork was a deeper blue, and even the edges of the low bookshelves between the door and the fire-place had been painted. He wanted to fetch his books and arrange them there right away and get Joe to help him lay out his model railway on the floor. It was some time before he could tear himself away from it all, and the look on his face when he met the painter downstairs was enough to tell that old gentleman that at least one of the Whitehouse family was satisfied with his skill as a decorator.

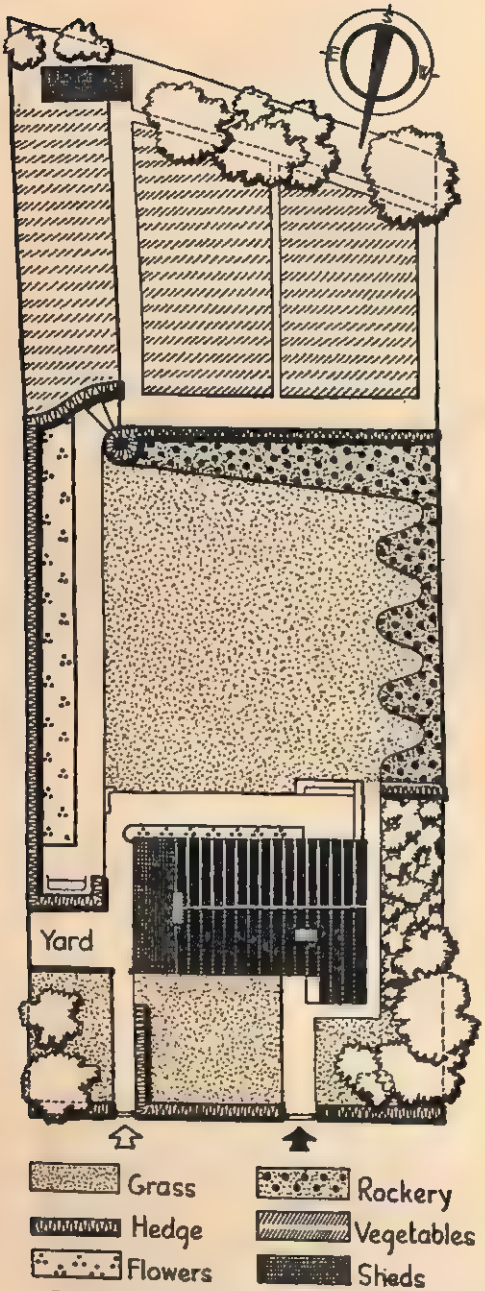


Fig. 103. The garden plan. Why is the main path at the side and not down the middle? What additions would you make?

PLANNING A GARDEN

THE Whitehouse family moved to their new home early in September. They spent a busy week or two in fixing carpets and curtains, coat-hooks and cupboards to their liking. One evening Mrs. Whitehouse turned from the living-room window, where she had just drawn the curtains and asked when someone was going to start tidying up outside.

"You haven't given us much time yet, Mother, have you?" laughed Mr. Whitehouse. "But I have been thinking about it. It is time we got started on the garden. I had a talk with one of the gardeners at the Park, and he is coming on Saturday afternoon to give us some advice. He's like the builders, and says we must have a plan before we start digging. I thought Jim could draw one for us so that we can mark where to put paths and lawn and flower-beds. You'll want a pleasant place to look at and somewhere to sit on hot days, as well as some fresh vegetables, I expect."

Jim and Joe got busy after school the very next day. The new wheelbarrow was got out and the broken bricks and stones gathered into a pile. All the big weeds were dug up and stacked in another corner. Then they measured up the ground and drew a good big plan. All Friday evening they spent on some mysterious job in the tool-shed.

Soon after dinner on Saturday the gardener arrived. He spent some time looking round and then suggested that they should have a flagged space next the house and opposite the side door. Then would come the lawn. The vegetable plot could be at the far end and about the same size as the lawn. As the ground sloped away from the house it would be easy to make these three at different levels. Steps would be needed in the path but the garden would look better if arranged in that way. Between the house and the footway it was decided to have grass plots and a few shrubs surrounded by a low hedge.

With these points settled they went indoors;

Jim produced his plan and they marked on it the paths and the sizes of the various sections. Jim acted as clerk and wrote down the names of shrubs and plants that the gardener said might be planted in the different positions as he marked them on the drawing.

Whilst they had tea, Mrs. Whitehouse had much to say about paths. She wanted something clean and quick-drying. It was decided to have paving on the terrace, concrete along the side of the lawn and hard gravel on the main path in the vegetable plot.

Some heavy work was going to be needed in levelling the lawn and terrace, and here the gardener gave them some useful tips. He showed them how they might drive in stout pegs and use a board and spirit-level to get their tops all at the same height. They could then see where the surface must be lowered and where it needed building up.

"First strip off the turf and put it in a pile to rot. Next year you will be able to dig that into your flower-beds to improve the soil there. When you have removed the turf you should take off the top six inches or so of soil and pile that to one side. When you have levelled the ground spread your top soil evenly over it. That sounds a lot of trouble but it is well worth while. If you bury your top soil you'll bury your garden! I should double dig the vegetable plot and bury the turf there with any leafy rubbish as you go along. If you grow nothing but potatoes on it next year that will give you a chance to get rid of weeds and have the soil in good form for the following season."

After tea Jim produced his kite string and a whole lot of pegs the boys had made the night before. Before dark the main paths had been marked out and they felt the garden had been really begun.

The first task was to lay out the terrace and paths so that the necessary concrete work could be done before the frosts came. Then the ground for the lawn was levelled and its top soil spread unevenly so that the frost would break it up ready for sowing the grass seeds in the spring.

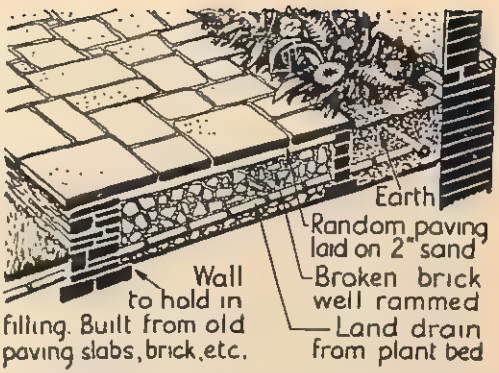


Fig. 104. Building the terrace. What sort of pipes would be used for draining the flower-bed?

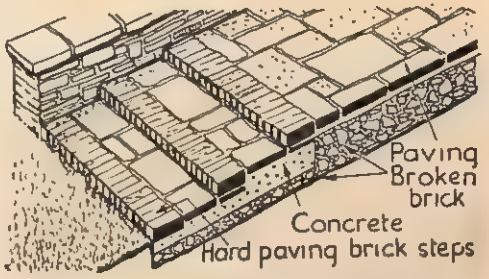


Fig. 105. Building the steps. Why are they laid on concrete? Is it sensible to have grass close up to the bottom step?

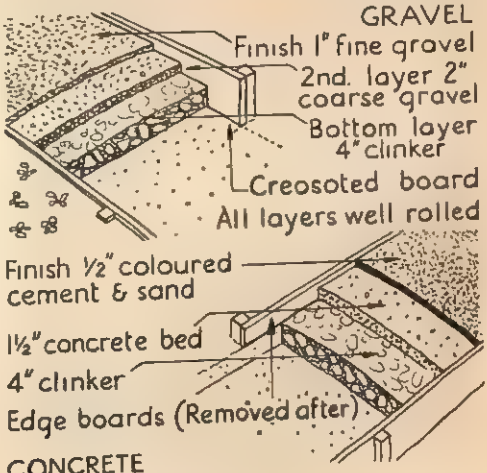


Fig. 106. Laying the paths. Which do you think the better type?

In what ways is each of these a bad site for houses?

Fig. 107. Crowded houses in an unplanned town.

Fig. 108. Houses facing spoil banks of a mine

Fig. 109. Houses alongside a railway.

GOOD HOUSING

(i) THE SURROUNDINGS OF THE HOUSE

IN the long dark evenings of their first winter at Millbank the Whitehouse family often talked about houses and their building. Jim's mother was never tired of telling how much pleasanter her life was in the new home. Jim himself was constantly finding how many useful things he had learned from the workmen. Mr. Whitehouse had so much to say about housing that the others told him he ought to get himself elected to the Town Council. He surprised them one night, however, when he told them he had promised to talk to his club on the subject so they had better get his speech ready for him. Jim could help by gathering pictures and making drawings for him.

They decided the best way to begin would be to put down all the ideas that came to them, and then sort them into groups. Mr. Whitehouse said he wanted to talk about the surroundings, the sort of place where one can put a good house. "It should be a pleasant place, not one where the only things you can see are backyard walls and factory chimneys or a long straight row of other folks' houses; grass and trees are much nicer. If we don't have plenty of space round the house, we get too little sunlight and too much smoke. In that old house of ours in Eden Street there was nowhere fit where we could sit out-of-doors. Here I can see Mother taking her chair out to the lawn in the fine weather to do her mending or for an afternoon nap. I notice the baby next door does most of her daytime sleeping in the garden and her three-year-old brother plays out there too. It must save their mother a lot of worry and trouble to know they are safe and quiet there, right away from noisy and dangerous traffic. And I'm sure the youngsters will grow up healthier and stronger for it."

Jim had something to add before he went off to bed. "You have forgotten the recreation ground, Dad. That's what the Council is making in that big field behind Millbank school.

I met that chap from the Park this morning, and he said he was going to work there for the next few months, so I went round on my way home to see what they were doing. They are levelling a big patch now and putting down turf for a cricket pitch. He told me we will be able to play football there soon after Christmas. There are to be tennis courts and a bowling green too, so you'll be able to play again, Dad. You ought to mention that. I heard some of the teachers talking about starting a tennis club, so I hope there will be a cricket club too that I can join when I leave school."

"I hope neither you nor the Town Council will forget the womenfolk," remarked Mrs. Whitehouse. "We ought to have somewhere at the recreation ground where we can sit and talk and have a cup of tea whilst the youngsters are enjoying themselves on the grass. And when you are talking about surroundings you had better mention that we do have to go shopping and we'd like somewhere to meet and get to know our neighbours."

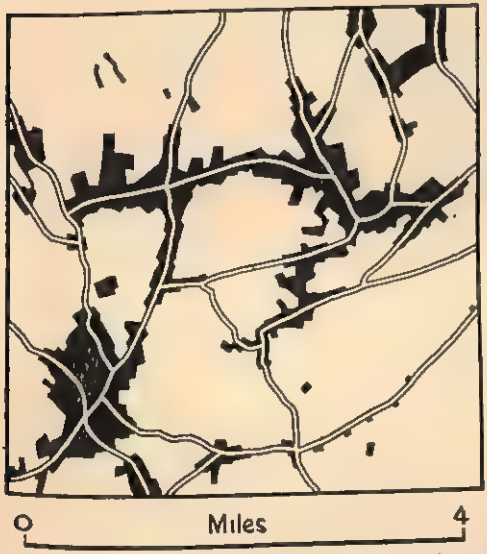


Fig. 110. "Ribbon development." This map shows how houses were built along main roads in a suburb of Birmingham. Compare it with Figs. 37 and 38.

Fig. 111. Suggested grouping of houses in a market gardening district.

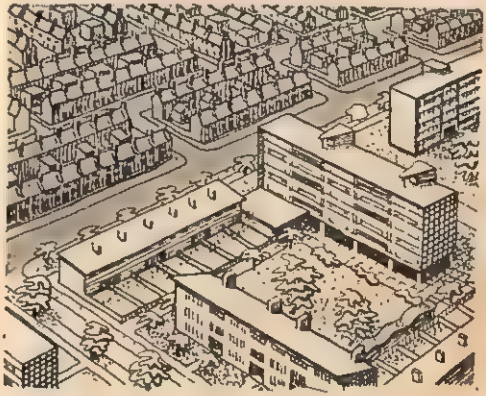


Fig. 112. Replanning a crowded London district. Just as many people live in the area as before.

Fig. 113. Houses in a quiet street. In this new "saw-tooth" plan the houses are set at an angle to the line of the road with enclosed yards between each pair. The house-fronts are built of long concrete blocks.

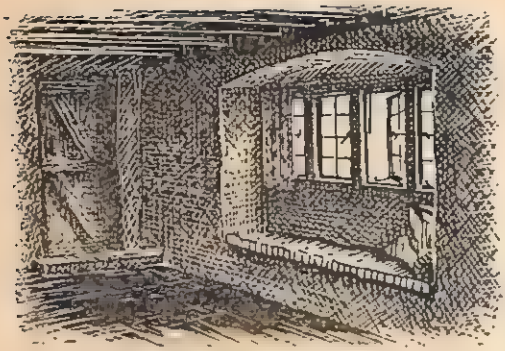


Fig. 114. Window-seat in an old cottage. Ventilation and lighting of the room are poor because of the small windows and the depth of the window recess. The window seat gives the only place where fine work can be done.

Fig. 115. Around the fire in the old cottage living-room. The kitchen range and its fire are the sole means of cooking and of drying wet clothing or washing. In cold and rainy weather its hearth is the only warm spot for children to play, mother to sew, father to rest in and all the family to bath.

Fig. 116. Where the water sometimes gets to. The outside tap in this alley is the only water supply for several families living in worn-out houses in a city slum

GOOD HOUSING

(ii) THE HOUSE ITSELF

"WELL, Mother, it's your turn tonight," said Jim's father a few days later. "What are your ideas about this good house I'm to talk about?"

"I can tell you one thing straight away," said Mrs. Whitehouse as she put down one of Jim's shirts she had been mending. "It must have plenty of light. In the old house this job would have had to wait till tomorrow, and then I'd have had to put my chair close to the window to do it comfortably. I like the big windows here as well as the good light we have after dark.

"Then, I don't suppose you've noticed it in here, but there's a bitter north-east wind blowing outside. You wouldn't have wanted to leave the kitchen fire and go upstairs to the cold bedroom in Eden Street, and Jim would have wanted his bath on the hearth-rug. I count a nice warm house among my blessings these days, I can tell you. And you don't need to ask about the warm summer days either. Up here I'll be able to open all the windows, and the doors too, without getting dust off the streets and smells from factories all through the house.

"I don't suppose you'll forget to say something about the water supply, for I'm sure you've not forgotten how you used to grumble at getting up early on wash-days to carry water across the yard to fill my wash-house copper. Any decent house will have both cold- and hot-water taps where they're needed, upstairs as well as down. You wouldn't believe how much work for me those taps have saved.

"If I were talking to your club I'd have a lot to say about the waste of women's time in working most houses. Builders are far too fond of giving us a big old-fashioned kitchen and calling it a living-room. The women who spend their lives in them don't call them that, I know. Yards to walk to get anything you want and the rest of the family always in the way—Jim doing his homework or you repairing

the radio on the table when I want to get supper laid or do my ironing. The kitchen's the housewife's workshop, and she wants her tools within reach and not to be cluttered up with folk doing other jobs. I really think I'd put that first, Dad.

"A good house is one that is easy to run: one that isn't constantly being dirtied with dust and smoke; one that can be quickly cleaned; and one where meals can be got ready easily and quickly."

"You're forgetting things too, Mother, just like Dad," broke in Jim. "Don't forget I want a room of my very own, where I can do things and leave things about when I want to, instead of having to clear them away because it's tea-time or one of the neighbours has come in for a gossip. And you'll surely not forget a shed, Dad, where we can work without worrying Mother with the noise and the mess. I'm sure other lads will want those things too."

We do not know whether Mr. Whitehouse's clubmates liked his speech or not, but, as he said himself, if it didn't turn out to be much good in the end it was not for want of help!

SUBJECTS FOR DEBATE

1. Which is the best type of house for (*a*) town-dwellers; (*b*) country-dwellers: the bungalow, the two-storey house, the flat (or tenement house)?
2. What is the most suitable building material for houses in your district?
3. Which of the building trades is the most attractive to young workers?
4. Should a house-planning committee have women members?
5. Is it better to build new houses on the outskirts of our towns or on sites cleared of old houses?
6. Which is the better arrangement for a small house: separate small dining- and sitting-rooms or a larger combined living-room?
7. Why have big bedrooms when you only sleep in them? How big should they be?

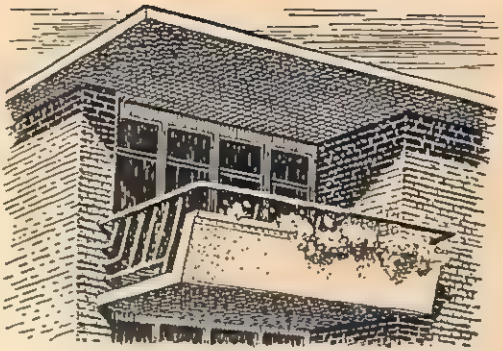


Fig. 117. Window and balcony in a modern flat. The large window space gives plenty of light in the room. The balcony, in fine weather, becomes an extra room, sheltered from most winds.

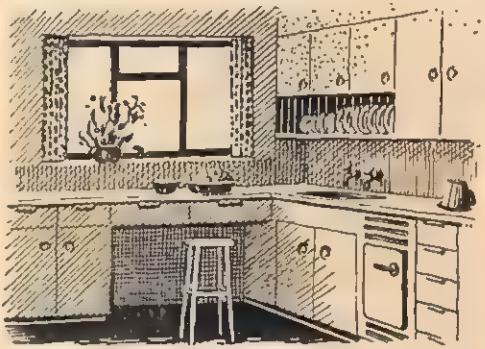


Fig. 118. A corner in a modern kitchen. Compare with the old-fashioned kitchen in Fig. 115.

Fig. 119. Where the water comes from. A reservoir in the mountains which supplies water to a distant city. How has it been made? Why was it constructed in the hills? Why are there no villages around its shores?

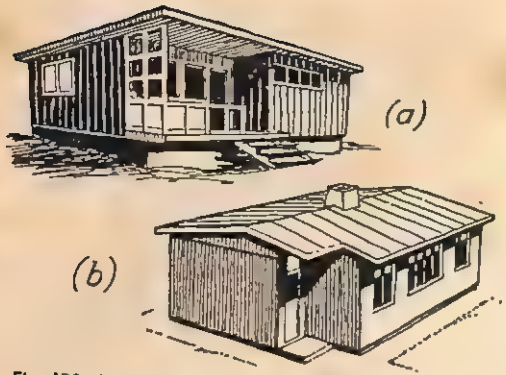


Fig. 120. (*a*) A prefabricated house from U.S.A. constructed entirely of timber. (*b*) An English prefabricated bungalow of aluminium. Planned to use as little timber as possible.

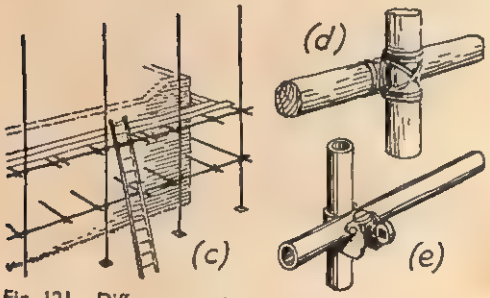


Fig. 121. Different methods of scaffolding.

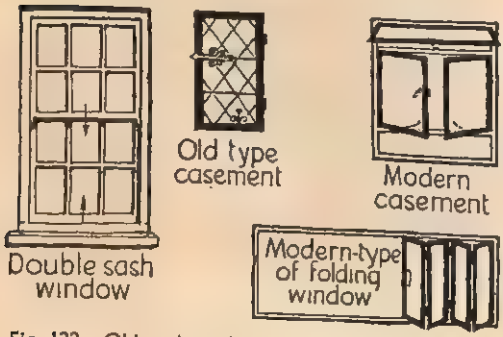


Fig. 122. Old and modern types of window.

1 Look again at the last four pages and their pictures. If you had to give a talk on GOOD HOUSING, what other things would you mention that the Whitehouse family have forgotten?

What local houses would you mention to illustrate good and bad points?

2 Fig. 120 shows two prefabricated houses, i.e. houses built in factories and put together on the site. Each contains living-room, kitchenette, bathroom and two bedrooms. Which looks better? Why were different materials used? Why were such houses built in Britain? What seem to you to be the good and the bad points of this method of building?

3 As the walls of a house are built up, it becomes necessary to erect scaffolding from which to carry on the work. Wooden poles or strong steel tubes are used for the purpose. The vertical wooden poles often stand in barrels full of earth. Why? What replaces this when steel tubes are used? Make a model scaffolding with wooden meat-skewers or penholders. How are the horizontal poles fastened to the vertical so that they do not slide down them when in use? How are the steel tubes secured?

4 Heavy materials—mortar, bricks, roofing timbers—have to be got aloft as building proceeds. What different methods are used to do this?

5 House windows are generally either of the *sash* type or the *casement* type. Which is better in your opinion?

If well made, the sashes in the former type should move freely in the frames and should stay in position when partly opened or closed. How is this managed?

Some old wooden windows were made in two parts, one fixed and the other movable, sliding sideways behind the fixed half. What were the advantages and disadvantages of this type?

6 Door fastenings have a long history. Do you know the story of Kate Barlass who kept closed the door of a Scottish king's room by thrusting her arm through the sockets made for a bar of wood? That was the first kind of door fastening. Then came the bolt that could be withdrawn from the outside by pushing a finger through a hole in the door made for the purpose; that finger was the first door-key. Then came the sneck or latch that secured the door as it closed behind you. All modern locks are simply bolts moved horizontally when the key is turned.

Collect any old locks you can obtain. Take them to pieces and find out (*a*) how the turning of the key causes the sliding of the bolt; (*b*) why only one pattern of key will open a particular lock.

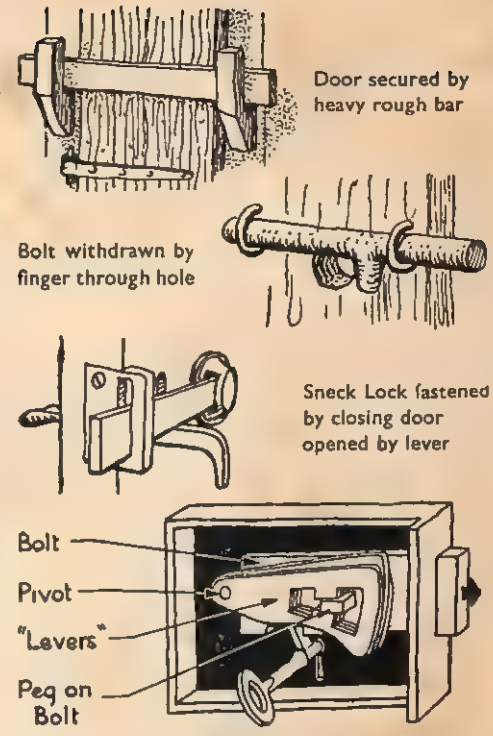


Fig. 123. From door-bar to modern lock.

7 Fig. 124 shows the journeys necessary in the preparation and clearing away of a meal.

Make a copy of the plan of Mrs. Whitehouse's kitchen and mark these journeys upon it. Does it show anything to be wrong in the planning of that room? Where is the best position for her china cupboard?

Now make a plan of your kitchen at home, and see if you can suggest a new arrangement of its contents so as to save your mother some of her journeys.

8 Rain driving against most house doors will find a way in. See how many ways of trying to prevent this you can discover and how successful they have been.

9 Jim's new house has two entrances from the street. One is a footpath, the other is wide enough to admit a lorry. Design wooden or iron gates for each.

10 Mr. Whitehouse could not pay the whole cost of the house at the time it was built. Find out what arrangements he could make for later payment.

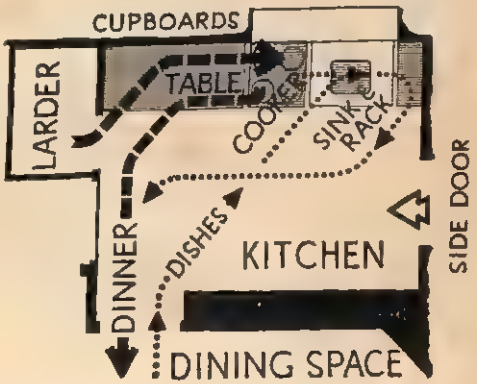


Fig. 124. The travels of a dinner

GLOSSARY AND INDEX

AIR-BRICKS, 28 — Perforated bricks built in wall to allow air to pass freely below floors.
AMPERE, 39 — Unit used in measuring the strength of an electric current.
ARCHITECT, 18 — Man responsible for designing a building, drawing plans and preparing specifications.

ATTIC, 13 — A room formed in the roof space of a house.

BALL-VALVE, 43 — Self-acting valve closed by rise of a floating ball.
BANISTERS (*or* BALUSTERS), 35 — Upright bars supporting a hand-rail.
BAY, 10, 11 — A section of an early type of house.
BEVEL, 32 — Tool used by carpenter in marking off angles for cutting timber.
BOILER, 44 — Vessel in which water of domestic system is heated.
BOND, 27 — Pattern of arranging bricks to give strong walls.
BRICK, 49 — Rectangular building blocks made by burning clay.
BRICKLAYER, 24, 26 — Man employed in building with bricks.
BUILDING LINE, 23 — A line parallel to a street in front of which no building may extend.

CARPENTER, 28, 46 — A worker employed in erecting buildings or parts of buildings made of timber.
CAVITY WALL, 26, 37 — A double brick wall with an air space between the two sections.
CEMENT, 22, 26 — A powder made from a roasted mixture of clay and limestone. When wetted it quickly sets hard.

CHIMNEY, 13 — Outlet carried through the roof to enable smoke to escape from a fire.
CISTERN, 42, 44 — Closed metal tank used for storage of water.
CLUNCH *or* COB, 11 — Mixture of crushed chalk and clay, sometimes with chopped straw; occasionally used for wall building.

CONCRETE, 22, 31, 42 — A mixture of gravel or broken rock with cement mortar.
CONDUITS, 34, 38 — Thin metal tubes through which electric wiring is passed.
CONTRACT, 22 — Written document signed by owner and builder in which latter undertakes work specified for an agreed price.

CONVECTOR, 36 — A heater which supplies a current of warmed air.
COOKER, 36, 47 — Apparatus used in heating of food.
CORRUGATED SHEETS, 15 — Thin sheets of metal or asbestos with waved surface; often used for roofing.
COURSE, 27 — A single layer of bricks or other material in a wall.
CRAMP, 34 — Tool used by carpenter to press edges of planks tightly together.
CRUCKS, 8 — Heavy curved timbers used in early building to support ridge.
CUPBOARDS, 38, 46 — Enclosed storage space usually with doors and shelves.

DAMP-COURSE, 26, 28 — A layer of slate, lead or tarred felt placed above ground level to prevent rise of moisture from soil.

DISTEMPER, 52 — A kind of paint, usually mixed with water, applied to internal walls.
DRAINS, 20, 45 — Buried earthenware pipes used to carry waste from house and rain from roofs to sewers.

EAVES, 11, 32 — That part of the roof which extends beyond the walls.
ENAMEL, 52 — A paint giving a glossy, hard, water-resisting surface.

FIRE-PLACE, 36, 37 — Metal, brick or tiled surround of fire space in a room.
FLATS, 30, 31 — Dwellings, forming part of a large building block, usually with rooms all on one level.

FLOOR, 6, 7, 34 — Prepared walking surface in a room.
FLUE, 13, 37 — Channel left in wall to carry smoke from fire-place to chimney.
FOUNDATIONS, 22 — Concrete, brick or stone base on which the house walls stand.
FUSE, 38 — Short wire inserted in an electric circuit which fuses (i.e. melts) when a dangerously strong current passes through it. Thus a 15-amp. fuse allows up to 15 amperes to pass, but not a stronger current.

FUSE-BOX, 38	A closed container, usually of metal, for the main fuses in the electric wiring of a house.
GABLE, 10, 12	End wall of a house or its triangular upper portion reaching to the ridge.
GALVANIZED SHEETS, 15	Thin steel sheets coated with zinc to prevent their rusting.
GLAZING 50, 51	Fitting panes of glass into frames.
GROUND PLAN, 20	Drawing showing position and arrangement of lower rooms.
GUY ROPE, 4	Rope supporting an upright pole and passing from its top to a peg driven into the ground.
HAND-RAIL, 35	A rounded rail placed alongside a staircase to help people climbing the stair.
HIP-ROOF, 32, 33	A roof in which the ridge does not reach the full length to be covered.
HOD, 24, 27	Open wooden receptacle used in carrying mortar or bricks. Its long leg allows load to be balanced on the shoulder while leaving both hands free for ladder climbing.
HOT-WATER CISTERN, 44	A tank for storage of hot water.
HOT-WATER SYSTEM, 44	Arrangement of boiler, pipes and cisterns which provide heated water for domestic use.
IMMERSION HEATER, 36, 45	A sealed metal tube containing an electrically heated element which can be placed in a tank or cistern.
JOISTS, 12, 28, 33, 35	Heavy timbers extending between walls to form support for floors.
KEYING, 40	Grooves or spaces left in walls and ceilings to give support to plaster coatings.
KING-POST, 9, 10	Central post, forming support for roof-ridge.
KITCHEN SINK, 43, 46	Receptacle beneath taps in kitchen with outlet to drain.
LANDING, 35	Level space of flooring at head of staircase or forming break between two flights of stairs. In the latter case it is sometimes called a half-landing.
LEAN-TO, 10	A small room attached to a larger building so that its roof rests against a wall of the latter.
LINE AND PINS, 26	A cord stretched between steel pins inserted in joints of brick or stonework to ensure straightness of wall being built.
LOFT, 12, 13	An attic or roof space.
MASON, 24	A builder or worker in stone.
MORTAR, 11, 26, 42	A mixture of lime or cement with sand, used to fix bricks or stones in building.
NEIGHBOURHOOD UNIT, 16, 17	A section of a town grouped around its own shopping centre and public buildings.
NEWEL-POST, 35	Stout upright post supporting hand-rail of staircase.
PAINT, 51, 52	A mixture of oil, spirit, and colouring matter applied as a protective or decorative covering to woodwork, plaster, etc.
PANEL, 11, 41	A portion of a wall or other surface enclosed in a wooden frame.
PATH, 54	Narrow strip of ground prepared to form a clean, firm footway.
PLANS, 18	Drawings showing to scale outlines, on a horizontal plane, of a building and its parts.
PLASTER OF PARIS, 41	A white powder which quickly sets hard when wetted.
PLASTERING, 40	Covering a surface with mud-like material which dries hard.
PLUMB-LINE, 24, 27, 31	A heavy weight hung on a string and used to check if a surface is vertical.
PLUMBER, 42, 44	A worker in lead; fits water pipes and metal roof coverings.
PORCH, 37	Roofed extension over an entrance, built out beyond main line of wall.
PRIMING COAT, 50	The first coating of paint applied to new work; usually contains red lead.
PROFILE RAILS, 22	Short planks attached to stout pegs and used to mark out widths and directions of foundations.
PUTTY, 51	A mixture of whiting and linseed-oil used in glazing and for filling small defects in wood surfaces.
RAFTERS, 10, 32, 33, 48	Sloping roof timbers stretching from walls to ridge.

RANGE, KITCHEN, 36, 58	Metal portions of fire-place, usually including oven and boiler as well as fire-grate.
RECREATION GROUND, 56	Land set apart for games.
RIDGE, 8, 32, 33	Horizontal beam forming high edge of roof.
ROOF, 6, 7, 8, 9, 32	Top covering of space occupied by building.
ROOF TRUSS, 10, 11	Framework of timber or steel supporting rafters.
ROUGH-CAST, 41	Outside wall covering of stone chips set in cement plaster.
SCAFFOLDING, 32	Temporary framework of poles or tubes on which planks are laid when building walls.
SERVICE PIPE, 42	Pipe carrying supply of water from main to storage tank in house.
SEWER, 20	Large pipes laid by local council to carry waste and rain-water from buildings and ground in its district.
SITE, 22, 30	Ground on which building is erected.
SKIRTING-BOARDS, 35, 47	Boards attached to walls at floor level to keep out draughts and protect plaster.
SLATES, 9	Thinly split sheets of fine grained rock used for roof covering.
SOLAR, 12	Sun-room; early upstairs room lit by window in gable.
SPECIFICATIONS, 19	Detailed instructions to builder as to kinds and sizes of materials to be used.
SPIRIT-LEVEL, 23, 27	Tool used to check if surfaces are truly level.
STAIRCASE, 35	Structure, usually of wood, to allow one to pass from one floor level to another.
STOPCOCK, 42	A tap or valve placed in a pipe so that flow of water through it can be stopped.
STORAGE TANK, 43, 45	Cistern, usually in roof space, which supplies water to hot-water system, etc.
SWITCH, 38	Apparatus by which connection can be made or broken in a cable carrying an electric current.
TAP, 42, 43	Control on water outlet, permitting water to be drawn off when needed.
TENT, 4, 6	Light, portable shelter, usually of fabric stretched over framework.
TIE-BEAM, 10	Horizontal beam of roof framework; stretches from wall to wall.
TILES, GLAZED, 41	Small tiles with glass-like surface, used for decoration or on floors or walls which are frequently washed.
TILES, ROOFING, 9	Thin sheets made by burning clay and used for roof covering.
TONGUED AND GROOVED BOARDS, 34	Boards shaped with a narrow groove on one edge and a corresponding ridge on the other; often used for flooring.
TOP SOIL, 55	Upper layer of soil in which roots of most plants grow.
TROWEL, 24, 26	Tool with which bricklayer or mason picks up, spreads and smooths off mortar.
VARNISH, 50	Gum or resin dissolved in spirit or a drying oil. When applied to wood it leaves on drying a transparent, glossy and waterproof surface.
VOLT, 39	Unit used in measuring rate of supply of electric current, e.g. in most areas this is now 210–230 volts.
WALL-PLATE, 10, 32	Planks laid along top of a wall on which ends of rafters or joists rest.
WATER PIPES, 34, 42, 43	Pipes of lead or copper carrying water supply throughout house.
WATTLE AND DAUB, 11	Woven twigs covered with clay, used to fill panels in old wood-framed houses.
WEATHERBOARDS, 41	Overlapping boards fastened horizontally on outer walls to throw off rain.
WELL-HOLE, 29	Gap where head of stair passes through upper floor.
WIGWAM, 4, 6, 7	Red Indian's conical tent of poles hung with bark or skins.
WINDOW, 6, 12	Really a space in outer wall, but generally applied to glazed wooden or metal frame which fills it.
WINDOW-SEAT, 18, 35, 58	Seat built along wall immediately at foot of window.
WIRING, 38	System of covered copper wires carrying electric current to lights, switches, etc.
YURT, 6	Circular tent of felt spread on trellis framework; used by Tartar steppe-dwellers.

INSTITUTE OF EDUCATION FOR WOMEN
Dept. of Extension
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CALCUTTA-27


SOURCES OF BUILDING MATERIALS
Cement
Timber
Bricks
S
Bricks
Timber
S
L S Bricks
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L
S
S
LEEDS
Cement
HULL
Bricks
Timber
Timber
Bricks
Gravel
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LIVERPOOL
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Bricks
Glass
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Bricks
Slate
Slate
Gravel
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Timber
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Cement
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BRISTOL
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Timber
LONDON
L
Cement
Bricks
Gravel
Cement
Gravel
Gravel
S
S
KEY
L....Limestone burned for Lime
S....Building Stone, usually Sandstone or Limestone


MEN
AT
WORK